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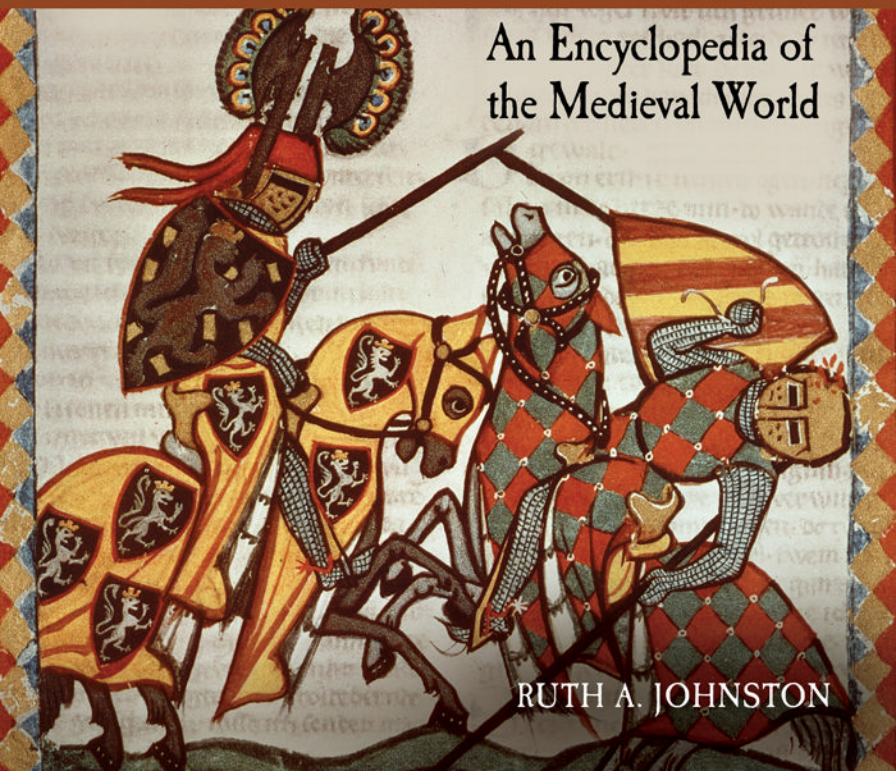
All Things Medieval

An Encyclopedia of the Medieval World



RUTH A. JOHNSTON

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An Encyclopedia of the Medieval World

Ruth A. Johnston

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Introduction

This book is about the material culture, the things, of Europe in the Middle Ages. These things include nearly everything that could be seen, heard, touched, tasted, met, or experienced. The material culture's center is in the home and the workplace. All things in the home and at work are contained in the scope of this book. The church and the monastery had their things, as did the warriors. There are things in entertainment and the arts. Some people are counted as things, particularly if they were notable types throughout Europe who were defined by having a unique set of things. Two key events, the Crusades and the Black Death plague, are included because they shaped the material culture in dramatic ways and also had their own identifying things. The raw materials of the things are also included so that their nature and technology can be understood.

Europe is defined as broadly as can be useful. It includes Scandinavia, Spain, Europe's heartland of England, France, Germany, and Italy, and the Byzantine Empire that overlapped Europe and Asia. Information is not always available for all of these regions at all times, but where available, it has been included to give as broad a picture as possible.

Europe's Middle Ages span about 1,000 years, a time that transitions between antiquity and the modern world. Historians and authors have no exact dates for when the Middle Ages began and ended. It is the period between certain key events that clustered in the opening and closing centuries and seemed to mark a transition of culture and technology. This book uses roughly the years 550 and 1450 to define the Middle Ages.

The heartland of the Roman Empire, Italy, came under domination by the invading Goths at the end of the fifth century, and Roman rule shifted entirely to Constantine's eastern capital, Constantinople. Around the same time, the first Merovingian kings ruled the Franks; King Clovis I died in 511. Benedict of Nursia founded monasteries and wrote his Rule of Saint Benedict not long after 500. Around 550, the last Roman outposts in Britain fell to invading Anglo-Saxons. The Plague of Justinian carried off about one-third of Constantinople's (and Egypt's) population around 550. In Mecca, Mohammed saw visions and founded a new religion around 600.

These events define the effective beginning of Europe's Middle Ages, although the early years are often called, informally, the Dark Ages. Rome no longer towered over Europe with superior technology and culture and a strong government and army. The Goths in Italy, the Anglo-Saxons in England, the Franks in France and Germany, and the Visigoths in Spain were all relatively primitive and uncivilized compared to Rome and Constantinople. Europe's Middle Ages are the time when these Germanic tribes grew up, developing government, culture, and technology to match and surpass Rome's.

At the same time, the birth and growth of Islam also defined medieval Europe. Muslims were an aggressive force always pushing at Europe's borders. Defensive and aggressive action against Muslim armies was the heart of medieval warfare. The Muslim Caliphate, which spanned the southern shore of the Mediterranean Sea, was also a conduit for technology and products from far away. Gems, silk, spices, and ideas came from India and Persia through the Muslim Empire that united the Far East with Egypt and Spain. European culture imported products from Muslim traders while pushing back Muslim armies.

The most famous events in the Middle Ages were the Crusades, waves of defensive/aggressive war to take back territory from Islam. It was the age of the knight and his castle. Crusaders learned new construction methods and began building the classic castles of medieval Europe. Minstrels learned musical instruments from the East and sang "The Song of Roland" at tournament feasts. Spices from the East dressed meat, fish, and fruit in castle kitchens. The Byzantine story of Saint George and the dragon and travelers' stories populated Europe's imagination with knights, dragons, unicorns, lions, and sea monsters.

The medieval period in Europe was also the time when Latin dominated government, education, and literature. It was still the native language of Rome in 500, but Greek was already the native tongue in Constantinople. Latin was soon nobody's native language but everybody's common channel of communication. The Middle Ages were the time of Latin book production, Latin schooling, and Latin liturgy in the church. Lectures at the new universities of Bologna, Paris, and Oxford were taught in Latin.

It was the age of monasteries and the high-water mark of the Roman Catholic Church's influence. The Rule of Saint Benedict spread all over Europe. Both monasteries and convents dotted all regions thickly; they owned much of the land. Monks hand copied books and painted fanciful scenes and animals in the margins. Pilgrims venerated relics and donated to saints' shrines, and enormous cathedrals rose at these sites. Monastic choirs sang Latin plainchant under stone vaults and stained glass windows.

The governing system of medieval Europe was the Franks' feudalism. Designed as a way to create mini-kingdoms to support armed knights, feudalism assigned all land to men loyal to the king. Everyone who lived on the land was assigned to support these nobles with their labor, keeping only enough of their produce to live on. Towns began to grow, and peasants moved to the towns, but they needed to buy their freedom first, and towns had to be chartered by the king or count as free of feudal obligations. International commerce and technology grew within these free towns, but the countryside remained chained to feudalism.

The end of the Middle Ages was when, within a century, all these trends came to an end. By 1350, the Black Death plague had wiped out at least one-third of Europe's population, and feudalism stopped making sense not long after. By 1381, England's peasants staged a revolt. Gunpowder was coming into use around the same time, during the Hundred Years' War, and, by 1400, cannons were the key siege weapon. Armor and castles were quickly obsolete, and the arts of the knight became simply a rich man's sport. Restlessness and disillusionment from plague, famine, and war brought out dissent within the church, and the early Reformation came in the form of Lollards and Hussites. Latin was no longer anyone's native tongue, and reformers wanted the Bible to be in the vulgar languages, as secular books now were. Pilgrimages, monasteries, and relics lost influence, and many were destroyed in the 16th century. The modern world was being born.

The key date for the end of the Middle Ages is 1453—the fall of Constantinople to an army of Muslim Turks. The early Middle Ages had seen the fall of Rome and the birth of Islam; the period closed with a Muslim army triumphant in the remaining Roman capital. Gunpowder had breached the invincible walls. Scholars, artisans, and priests fled Constantinople as Roman scholars, artisans, and priests had fled Rome. They brought the learning of Greece back to Europe, and Europe's culture transitioned into the period we call the Renaissance.

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Agriculture

Some time in the seventh or eighth centuries, Europe entered a period of **climate** warming. The Medieval Warm Period increased average temperatures by several degrees, which opened higher elevations for farming and spurred a long expansion in farm productivity. During the ninth century, Europeans began to use a new plow, the moldboard plow, and their farming methods shifted to include other new technologies.

In most of Europe, farmland was owned by a lord or a **monastery.** The land was divided into several large fields. Peasants each held a certain strip of the field for their personal farming. The peasants cooperated with each other in plowing and harvesting but tended and profited from their own strips. They also owed free labor to the landowner, so they helped farm his strips as well. In the late Middle Ages, when the **plague** had badly reduced the peasant farming population, this system broke down, and landowners were forced to hire plowmen and harvesters.

Plows

Settlement in Northern Europe required some changes in technology. In the Mediterranean region, the soil was light and dry. It could be adequately plowed with a simple wooden scratch plow, which drew a stick through the surface, pulled by one ox. In Northern Europe, greater rainfall and clay content made the soil heavier. A shallow plow could not exploit the richer nutrients of the soil. In the sixth century, Slavs had developed the moldboard plow, a heavy wheeled plow that spread across Europe and revolutionized agriculture.

The moldboard plow had three parts: the coulter that slashed into the ground, the plowshare that cut horizontally at the grass roots, and the moldboard that turned the cut slices of turf on their sides. Where the old plow had cut a rough line in the soil, the moldboard plow sliced the soil and flipped it over, opening a much deeper furrow. The plow was mounted on wheels, since it was too large for a man to hold up as it cut through the turf. The wheels acted as a fulcrum so the plowman could bear down on the plow's handles or let up so the plow blade rose a little for easier handling. Its blades had to be made of iron, or at least shod with iron, to cut into the heavy soil and not be dulled by rocks.

The moldboard plow was so heavy it needed to be pulled by four yoke of oxen in most soil. Because few peasants owned eight oxen, villages pooled their oxen together and worked each other's field strips together. The number of oxen each owned may have determined his share of the plowed strips. This system, called open field farming, was dominant through the 12th century. The heavy plow also shaped the fields and their

system of measurement. Fields were not square, like modern fields, because it was difficult to turn the plow. They were long and narrow, and after a team of peasants plowed them together, they sowed their own strips with their seed.

The wheeled plow did not work in all kinds of soil. In places where the ground was too wet, the spoked wheels picked up dirt and became too heavy and caked to move well. Medieval plowmen also used foot plows and swing plows, which were similar to the original simple scratch plows. Foot plows had a board that lay on the surface of the earth and kept the blade from going too deep, while swing plows had only the blade for the plowman to control. Some medieval estates owned more than one kind of plow.

Seeds were broadcast by hand, not planted in rows. The sower wore a bag of seed over his shoulder and walked along the field, broadcasting seed with his hands; even coverage was the goal. Medieval fields are always shown thickly planted. Different grains were often sown together, since they could

A small wheeled plow, requiring only one yoke of oxen, works a spring field in late medieval Italy. Larger plows in northern Europe often required a team of up to eight oxen or horses and two men to work the heavy soil. (Giraudon/The Bridgeman Art Library)

be used together. Wheat and rye grew together and were harvested and milled together.

The harrow was invented after the heavy plow and was in use in England by the time of the Norman conquest. The plow cut deeply into the soil and turned it, but it left deep furrows and ridges. The harrow was a large wooden rake with iron teeth; a horse pulled it across the furrows, leveling them and burying the cast seeds. Even before **horses** were used to draw plows, they were used to pull the much lighter harrows.

Harvesters used sickles to cut the seed heads off the grain, leaving the stalks standing. A second harvesting pass with larger scythes cut the straw. In the 13th century, harvesters began to use larger scythes to cut the stalks above the roots and separate grain from straw during threshing. The earlier method created better straw, so when wheat straw was a valuable thatching material, it was worth the trouble to harvest twice.

The new plowing methods may have doubled grain yield per acre. In general, a farmer could expect to get back four times as much grain as he sowed in seed. Medieval seed heads for wheat and barley were much smaller than those of modern grain hybrids, so the yield of seed was not great. Each seed had to grow enough other seeds that the peasant could save some for next year's planting, give some to both church and manor in tithes and rent, and have enough to eat for the year. In bad years, families ate the seed they were saving for spring planting.

Food production went up quickly with the use of the new plow. New land could be cleared because this plow could handle the heavy soil of lowlands near rivers. Europe's population moved into these more fertile areas, which had been left wild. They also broke into new lands at higher elevations on mountain slopes.

Medieval farmers also learned to enrich the soil more effectively. The value of manure had been known since Roman times. Allowing sheep to graze on a fallow field left it spread with manure as fertilizer, and, in the early Middle Ages, manure was a sheep's most valuable product. Not only animal manure, but also the stalks of some plants such as hay and lupines, were left to rot or plowed under the soil. In the late Middle Ages, the Cistercian monks, who developed many iron-smelting operations, learned to gather the phosphate slag from their process to use as fertilizer.

Improved crop rotation was the next stage in the medieval agricultural revolution. Growing the same crop over and over in a field exhausts the soil, since each plant takes different nutrients and puts out different waste products. Since ancient times, farmers had known to allow a field to lie fallow in alternate years so weeds could replace what the soil had lost to grain. In the 9th and 10th centuries, European farmers began to farm their strips in a three-way rotation. When a strip was planted in oats or legumes in the

spring, it could be harvested at summer's end. It was then replanted in wheat and rye and later left fallow for a third season.

By using fall and spring planting, farmers could get an extra crop out of the same strip. On average, it may have added up to as much as 50 percent more food. The soil, refreshed by nitrates from the legumes, grew more grain. When rotation included oats, this high-protein grain allowed horses to be kept through the winter and worked harder.

Around the same time, the invention of the horse collar increased the horse's ability to pull heavy loads. The plow could be drawn by eight oxen or six horses, and sometimes with mixed teams of both. In a pinch, four horses or fewer could draw the plow. By the 14th century, many farms were switching over to all-horse teams. Horses increasingly used in farm work were also available for riding, and even peasants became more mobile, allowing for better access to markets and imported food. As horses replaced oxen, some small hamlets were abandoned, since the farmers could ride to their fields and keep their family homes in a larger town. Horses could also pull carts faster and farther than oxen. By the 13th century, horse transport lowered the price of food in towns and the price of manufactured goods in rural places.

Even with all these farming improvements, crops frequently failed. Too much rain was the worst cause; widespread famines year after year in the early years of the 14th century were caused by torrential, continual rains that did not permit the crops enough sunshine to grow. Another danger was a poisonous fungus, ergot, which grew on rye. Ergot was more prevalent in damp times, so the early 14th century was also a time of danger from ergotism. Since even high temperatures did not kill ergot, it was still active in rye bread. It contained many poisons, including the substance we know as LSD (lysergic acid diethylamide). A peasant with ergotism had abdominal pain, skin inflammation, and delirium. In some cases, it progressed to gangrene and death.

The Arab conquest of Spain brought another hazard. Arabs imported the barberry bush, which is host to a black stem rust virus that can devastate wheat fields. Mediterranean farmers did not know that the barberry bush, whose red berries were edible and medicinal, carried the rot. Famines followed these failures of the wheat harvest.

Irrigation

In the early Middle Ages, wetlands were wet and central plains were dry. By the 15th century, wetlands had been drained or crossed by causeways, small islands had been built into habitable dry land, and plains were irrigated. Flood and drought had not been such serious issues before that time; the Nile Valley routinely flooded, so nobody built houses in the floodplain.

After cities built down to shorelines and drained marshes, floods became disasters. Droughts were very serious in places that could not support farming with their normal rainfall.

Italy inherited Rome's network of dams, canals, and ditches and, after a period of disorganization, were maintaining many of them by the ninth century. Ditches can serve for both drainage and irrigation, but rivers were usually at lower levels than the land, and early medieval Italy had not yet installed **water** wheels or Archimedes's screws to move water to a higher level.

Muslim Spain used Middle Eastern methods of small-scale irrigation. Caliph Abd al-Rahman, in the middle of the eighth century, brought in irrigation technology as well as imported plants from Syria. They used waterwheel and bucket systems to lift water from a stream into irrigation canals. The waterwheels were not large and were often operated by animal or human muscle power. Valencia, in the central plain, was highly dependent on irrigation for its farming economy. There was a well-developed system of canals and water gates so farmers could regulate the canal's depth and how much water their lands received. The community held a court to make rulings over water disputes; the judges were farmers elected to the court who made rulings quickly and orally. The Water Court of Valencia is the oldest continuous self-governing institution in Europe.

Fruits and vegetables from the Near East came to Spain with the Islamic conquest. Among these imported plants, pomegranate trees flourished in the hot southern climate of Granada. The imported plants soon became part of the native scenery; the coat of arms of Granada includes a pomegranate. The picture shows a ripe pomegranate carved in relief on stone. (iStockphoto)

The expansion of irrigation allowed Spain's farming to increase to become a major exporter of some of its specialized products. Arabs brought to Spain a number of crops not before known in the peninsula, including rice, hard wheat, sugar, citrus fruits like oranges and lemons, pomegranates, bananas, spinach, artichokes, and watermelon. They also introduced cotton. An Arab emissary to Constantinople managed to smuggle out a seedling of a fig plant, and figs became a major export crop from Muslim Spain.

See also: Beekeeping, Food, Gardens, Horses, Wagons and Carts, Water.

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Ale. *See* Beverages

Alphabet

The northern Germanic tribes used runes cut in **stone** to make memorials. The runic script may have been developed in the southern Alps, where Germanic-speaking people had some contact with the Etruscan alphabet. The Goths who settled in Italy did not use runes, but the northern Germans used them before they adopted Christianity and the Latin alphabet. The 24 letters were usually written left to right, but they could also run right to left or upside down. Runes were never used for writing long texts; they were used to write names and places, simple transactions of making and buying, and charms.

Runes had religious meaning; in Norse legend, Odin invented them and used them for **magic.** In the Anglo-Saxon language, *rune* meant "secret." Each symbol had both a word meaning and a sound, and it could be used to stand for either. Even after the adoption of Christianity and Latin letters, runes were still used for decorative purposes and magic. They continued to

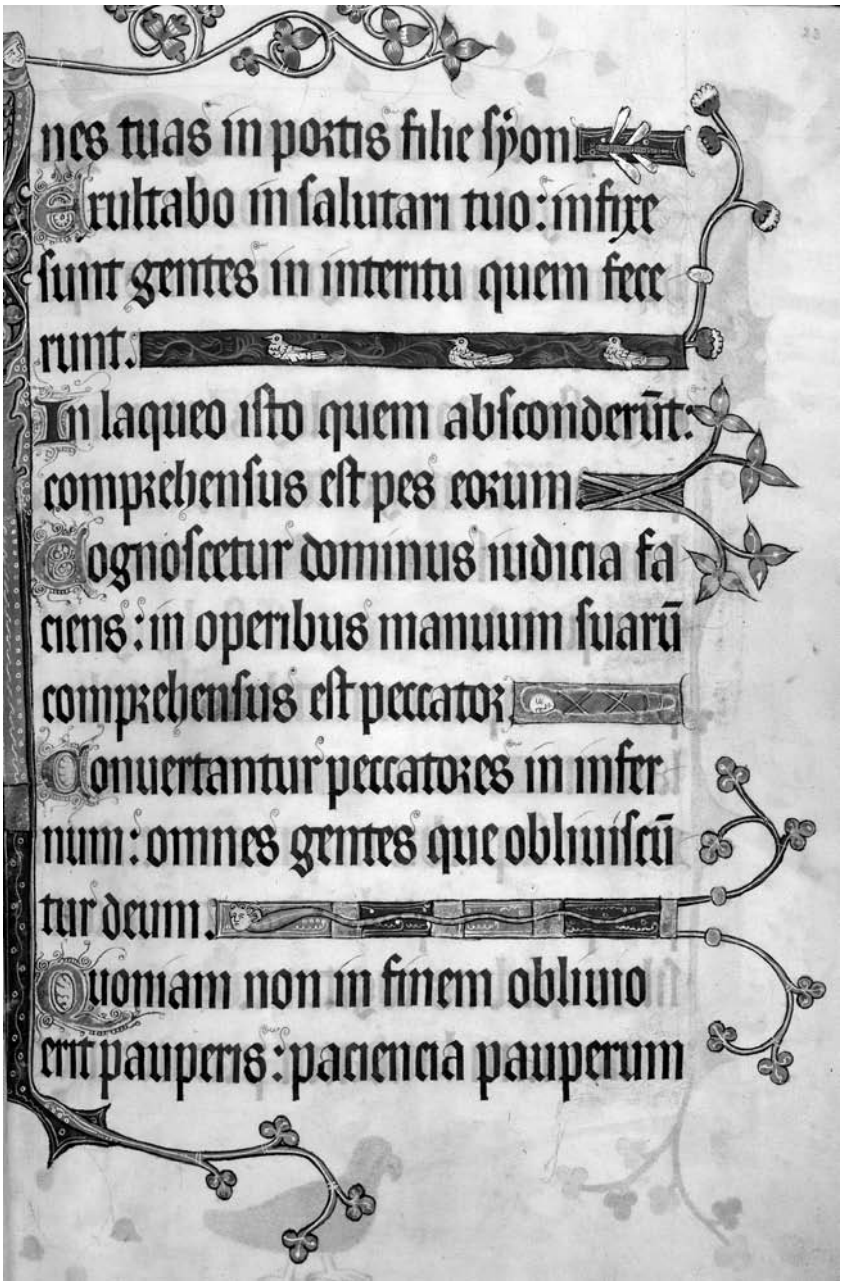
be part of folk culture in England; the Christian poet Cynewulf embedded runes in some of his poems as riddles and clues.

The Latin alphabet became the dominant script of Europe. Medieval script styles in Latin were developed first in **monastery** scriptoria and later were practiced in a community of lay scribes who worked near **universities** and taught by writing masters. Through the centuries, the letters evolved into the two alphabets used today, the capital and lowercase forms.

Roman script had written Latin in all capital letters, all the same size. Text written all the same size, like modern ALL CAPITALS, is called majuscule writing. The early Christian **church** adapted a form of this majuscule Latin script for its texts. The form in use at the opening of the Middle Ages, around the sixth century, was based on the Roman capital letters but wrote some of them larger or in a more exaggerated way. This way, scribes began to develop a system of capital and lowercase letters, a style of writing now known as uncial. Uncial letters were more rounded than the Roman style, as they were influenced by Greek. They were designed for pen and ink and had serifs—little decorative pen marks at the ends of lines. Scribes also began to create punctuation, which was unknown to Latin. Points and slanted lines began to indicate pauses and stops. The *S*-shaped question mark and a small dash to indicate quotation from a source also came into use in early forms.

A very formal uncial script now called artificial uncial came to England with the first missionaries and became the script of Anglo-Saxon monks. However, as scribes in Rome produced more manuscripts, the style changed again to include ascending and descending strokes that made the letters different sizes. A script that uses different sizes of letters is called minuscule. The seventh-century style is now known as half-uncial because the letters were first used to make small notes in **book** margins. The style was easier and faster to write. Half-uncial developed lowercase letters such as *b, d,* and *e* out of the short-cut cursive forms scribes had been using. Early cursive tied letters together with ligatures as the scribe's pen dragged between letters. Scribes developed certain letter combinations that were always tied with ligatures, a practice still used today (*ff* and *tt* are connected with ligatures in many fonts).

The monks of Ireland had been converted to Christianity during Roman times, and they continued to use a distinctive script that rounded the Latin letters. It is generally called insular majuscule because it was isolated on an island and the letters were all one size. Insular majuscule is familiar to modern eyes as the writing in famous works such as the *Book of Kells.* The letters were round, decorative, and frequently elongated or tied together with ligatures. The Irish monks also developed a minuscule script with lowercase letters. Insular minuscule had descending strokes in letters like *g* and *q*. Both these Irish scripts came to England, influenced Anglo-Saxon manuscripts, and then were copied in other European monasteries.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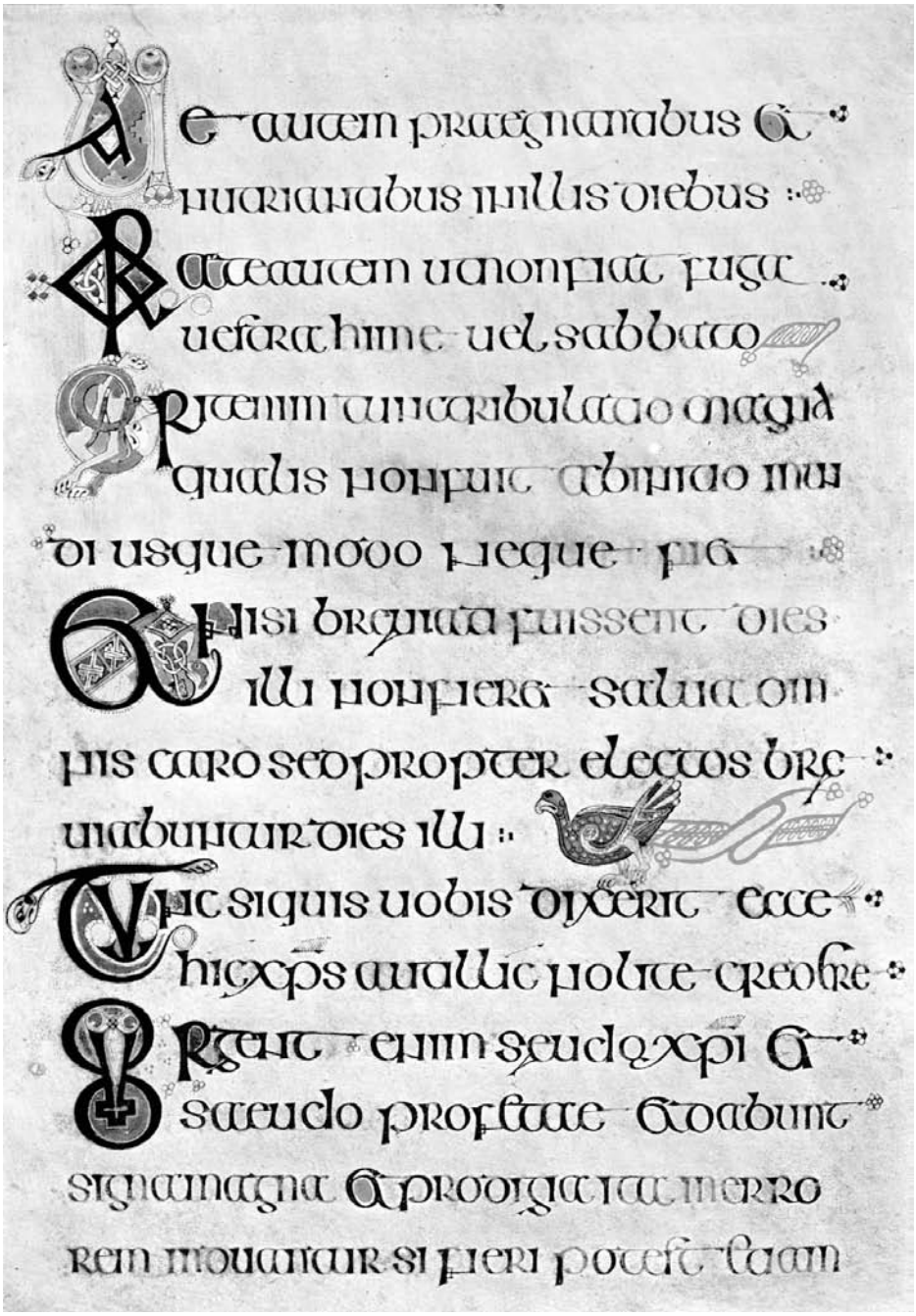
Quoniam non in finem obliuio
ne erit pauperis: patiencia pauperum

The Luttrell family's psalter, one of the best-preserved illustrated manuscripts, uses the 15th-century Gothic script. It was a minuscule script, although letters that started lines or sentences were often large and decorated. The lower loop of a *G* was closed, not open, in the Gothic; *R* was drawn in an abbreviated form; *S* was a straight line within a word, but at a word's end it appeared as an angled curve similar to a modern *S*. Some Gothic scribes meticulously drew three-pointed feet on the bottom of their letters, while others were content with simpler serifs. (The British Library/StockphotoPro)



Insular majuscule writing in the *Book of Kells* is made up of letters that resemble modern capital letters. This style, developed in Ireland, was beautiful but still easy to read. Here, many capital letters are decorated as animals. (The Print Collector/StockphotoPro)

By the eighth century, court scribes often chose to write scripts that were very difficult to read. If they were hard to read, they were also hard to forge, and it meant another scribe must be asked to read the document. Because they often wrote royal charters, the term "charter script" means this intentionally dense, complicated writing. They used exaggerated ascending and descending strokes and crowded the letters together. Merovingian royal documents are very difficult for modern scholars to read, and there is evidence that contemporaries, including the kings and Popes themselves, could not decipher them.

A new approach called for a new script. King Charlemagne set up **schools** and a scriptorium to try to copy as many texts as possible and build up literacy and libraries. He set an example by becoming the first pupil in his school, along with his sons. To build up general literacy and generate new books as quickly as possible, he needed a simple script that was easy to read and write. His English adviser, Alcuin, wrote in insular minuscule, but other styles met in the land of the Franks. A script from the monastery at Luxeuil featured exaggerated ascending and descending strokes, while scripts from Italy were more similar to the original Roman style. Alcuin and his scribes could choose from a variety of known styles.

Charlemagne's scriptorium developed a standardized minuscule style now known as Carolingian minuscule. It used moderate, conservative ascending and descending strokes so lines could be written closer together to fit more on a page, and its letters were rounded and uniform. It used capital letters and periods to set off sentences. Words had small spaces between them to make reading easier, although close word spacing continued to be an issue until the late Middle Ages. A lowercase *N* in the modern form *n* evolved, as did the earliest step toward a modern *W*, as overlapping *U* and *V*. Because Carolingian scribes copied a very large number of old texts that were falling apart, their script became universal and dominant. They also used some of the older scripts from the material they were copying in order to set off headings and first letters.

During the 11th century, a new script, now called Gothic, came into use. Gothic letters were narrower, in order to fit more letters on a page of parchment. They were written quickly, and the style included serifs—lines left as the **pens** were lifted at an angle. Ideally, the appearance of every letter was, at first, highly uniform, and to modern eyes the letters blur into a series of lines. Gothic letters were often connected by ligatures or ended with a flourish, and individual scribes, particularly in Northern Europe, sometimes made their Gothic letters so decorative that we have difficulty reading them. Some Gothic scripts used large, colored designs for capital letters called versals. Versals were often irregular or alternative shapes for the letters, and they were often set off in decorative boxes.

The Gothic script continued to be dominant through the 15th century, and since the architectural and artistic style was ornate, scribes wrote in increasingly ornate hands. Ascending strokes were tall, looped, curled, broken, and dotted. Descending strokes also curled and looped, and letters became slanted, rounded, and irregular. National script trends developed; letters tended to be tall and narrow in Northern Europe and rounded in the Mediterranean. Writing in Germany tended toward heavy strokes and elaborate capital letters. Paleographers call the uniquely ornate style that came out of 14th-century Germany "Gothic Littera Bastarda." Every hand in this style was different, although the letters had the same essential formation. Pages of ornate Gothic writing were as beautiful as stone tracery in a Gothic cathedral.

By the late Middle Ages, scribes in the more conservative Mediterranean regions were turning back to forms of Carolingian minuscule. Gothic letters had become too ornate and difficult to read. Carolingian minuscule became the basis for styles in the Renaissance and the new technology of typeface.

The Latin alphabet was not the only one in common use in medieval Europe. **Jews** continued to read and write in Hebrew, and the **Muslims** of Spain and Sicily used Arabic. Arabic was often written with elaborate, artistic calligraphy, and it influenced styles in art. Arabic writing was often painted onto ceramic dishes and woven into silk. Arabic was also the daily language of half the Mediterranean and most of Spain. Even Christians and Jews in Spain spoke Arabic and wrote Arabic treatises and poetry. Arabic was a more beautiful, civilized alphabet in contrast with the crude block letters of Latin.

Hebrew was influenced by Arabic to become more elaborate and decorative in the Muslim countries where Jews absorbed Arabic culture. In Northern Europe, Hebrew script was influenced by Latin and by the need to use it as a business correspondence language. During the Middle Ages, Jews in France and Germany developed faster, simpler ways to write the ancient Hebrew letters. Their shortcuts are now known as cursive, although the letters are not connected by ligatures as in a true cursive. Whereas the formal Hebrew script required calligraphy, medieval Hebrew cursive could be written quickly with lines. The cursive used in Israel today is very similar to medieval German Jewish cursive.

See also: Books, Pens and Ink.

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Animals

During the Middle Ages, the word *animal* meant any living thing, human or nonhuman. *Beast,* originally a French word for a wild animal, came to mean any nonhuman living thing and encompassed both domestic and wild animals by the end of the period. The distinction between wild and domesticated animals was not as clear in the Middle Ages as it is now. Even today, some dogs can be wild, pets, or working animals; at that time, many other animals could be any of these categories.

Medieval philosophers and common people were convinced that animals felt emotion and could think to some extent. Certain animals were thought to exemplify emotional or moral traits: dogs love their masters, apes are lunatics, camels are filled with lust, and lions do not hate men unless they are wounded. Although they did not consider man an animal, they lived in harmony with animals, surrounded by them at all times, down to the fleas on their bodies.

Books about Animals

There were many **books** about animals in the Middle Ages. The most common type had encyclopedia-style entries and was called a bestiary. The most influential was known as the *Physiologus,* after its anonymous author. This bestiary, emerging from classical times in Greek, was translated into every known language. The original had about 50 beasts; as it was translated and copied, anonymous authors added local animals as well as more hearsay. Artists added illustrations that were very inaccurate for unknown animals but quaintly accurate enough for native beasts.

Bestiaries began as guides to the animals of the Bible, many of which were unfamiliar to Europeans. The lion was not native to Europe, and its habits had to be explained. In later bestiaries, familiar European animals such as wolves and sheep were explained in moral terms, in addition to the exotic animals. Animals were described as morally good or bad. Wolves were the epitome of evil, and the habits of wolves could help a medieval reader

understand the habits of the devil. A wolf's eyes shine in the dark like a lamp because the devil's works seem beautiful. Wolves, the reader learns, cannot turn their heads to look backward, but must turn their whole body, which means the devil cannot turn and repent. Because bestiaries began as natural history companions to the Bible, they tried to provide sermon illustrations to teach moral lessons.

Bestiaries classified animals into beasts, birds, reptiles, and fishes. Reptiles and fish were grouped together in a primitive recognition of their cold-blooded nature. Bats were birds, but the bestiary noted that bats were the only birds that had teeth and gave birth to live young. Satyrs, mythical humanoids, were beasts. Ants were beasts, since they were not birds or fish, but worms of all kinds were classed with the snakes, with fleas added for completeness. Whales and dolphins were fish, and frogs were also grouped with fish. In some cases, an animal was clearly considered to be fish, bird, or beast, but in other cases, it may only have been a convenience of grouping. The Middle Ages did not seem to consider insects as their own class.

Rumored animals from far away also appeared in bestiaries; some are reasonably identifiable or even accurate (the hyena and the ostrich), but most

In a 13th-century bestiary, the wolf's image was more important as a symbol of evil and danger than as an accurate drawing of the real animal. (The British Library/ The Bridgeman Art Library)

are fictitious **monsters** (the griffin and the unicorn). The manticora, the medieval reader learned, was a man-eating beast with a lion's body and a man's face. The unicorn was the size of a goat, was both swift and fierce, and could only be captured by a young virgin. The phoenix, dying on its funeral pyre to come to life again, was reported as factually as any other animal. Some bestiaries tried to be careful, and one 12th-century work explained to the reader that the many-headed hydra dragon was a myth.

Bestiaries passed on the accumulated scientific knowledge of animals, often from Roman sources like Pliny the Elder. The information was more often inaccurate than accurate. For example, a 12th-century reader learned from one bestiary that the livers of mice are enlarged at the full moon, that weasels give birth through their ears or mouths, that rams butt heads because it helps the itching in their brains caused by worms, and that elephants live 300 years. Some accurate information could be found in a bestiary, especially concerning animals native to Europe. The stag's rutting season was accurately described, as well as the deer's habit of giving birth in a hidden place. Bestiary writers observed that deer moved upwind to mask their scent, migrated from pasture to pasture, and crossed rivers in a line. Even in relatively accurate information, inaccuracy and folklore intruded. Stags eat snakes to cure their sicknesses, said the writer, so if you want to keep snakes away, use the ashes of a burned stag's horn.

Writers of the later Middle Ages tried to improve the accuracy of these sources. The Dominican monk Albertus Magnus, writing in the 13th century, composed *De Animalibus,* a many-volume encyclopedia of animals based on the ideas of Aristotle, with several original volumes from his own observational knowledge. His motivation for writing was still to educate preachers and other writers about animals they might not have seen and to apply the animals' traits to moral teachings. However, unlike previous copiers and annotators of bestiaries, Albertus Magnus tested the unquestioned knowledge of the ancients by experimenting. He verified that moles did not have eyes but found that neither did they have black oil for eyes, as Aristotle had said. His concern was to make an accurate book as much as a complete book.

Veterinary information was nonexistent at first, and animals had no medical care. But as the wealthy began to have highly bred, well-trained animals, they wanted to know how to treat their disorders. Medical philosophy offered the same framework to animal **medicine** as to human medicine. All living things were made up of hot and cool, wet and dry. The creature's overall complexion was the way these four humors were balanced. Bees were cold and dry, while horses were hot and dry. Fish, obviously, were cool and wet. This system was very consistent and passed as scientific, but it could recommend few practical therapies for colic, sprains, worms, or injuries.

The falconers or **horse** trainers of kings sometimes wrote books. Emperor Frederick II of Germany himself wrote a treatise on the care of falcons, taking a scientific approach. His Master of Stables wrote a similar work on the care of horses that examined their common ailments and discussed how best to manage them. Veterinary medicine may have moved beyond Aristotle more quickly than human medicine, abandoning the four humors theory in favor of pragmatic therapies.

Domesticated Animals

Domesticated animals of the Middle Ages were the same kinds we still have on our farms and in our homes, although the animal breeds were somewhat different. A domesticated animal is entirely dependent on its owners for food, but a wild animal forages on its own. Some medieval farm animals were not fully domesticated and lived half wild. Pigs, horses, and even cows were sometimes kept half wild and lived on their own in **forests.**

When animals were free to forage for themselves, they often bred with wild species, such as the wild boar. Half-wild animals were often smaller, since they could not be selectively bred like farm animals. Although the Romans had practiced selective breeding to produce larger farm animals, the Middle Ages saw a reversal of this trend, and animals became on average smaller. Medieval pigs were only about one-third the size of a modern pig. Cows were smaller and leaner. Foraging also meant the animals did not get as much to eat as barn-fed animals. Farm animals tended to be kept longer than modern animals. Because they were smaller and leaner, they did not reach a useful size quickly.

Pigs were the chief animal raised for **food** in medieval Europe. They were smaller than modern pigs, but with longer legs. Like the wild boar, they had long faces with pointed snouts, were dark brown, and had very stiff, bristly hair. Unlike cattle and sheep, pigs did no useful work when they were alive, but they had the advantage of eating nearly everything. Pigs could be released to forage on acorns and beechnuts in the forest, or they could wander a town's streets, eating **garbage** and the waste grain from breweries. In **cities,** they were considered a serious nuisance. Not only were they voracious, but occasionally they killed a small child who also had been left to wander the streets. Many medieval towns tried to ban or restrict pigs, but they were too important to the medieval diet for the effort to be successful. Pork was easy to preserve, since it was still fairly good after being salted, smoked, or dried. Its fat was good for cooking. Pigs became less important in the food economy of the late Middle Ages because forests were being cut for charcoal to make **iron,** which reduced acorn foraging.

Cattle and sheep were more numerous than pigs after that time. However, the pigs that remained were more often kept in pigsties in the farmyard. These pigs grew larger and fatter and, over time, grew lighter in color and less like wild pigs.

Poultry were the most common animal kept by the poor, even in cities. In Anglo-Saxon times, England had more chickens than geese, but geese became the primary poultry of the later Middle Ages. Many manors also kept doves as producers of manure. The primary value of poultry was in egg production. Chickens and geese were only eaten for special occasions, since their eggs had more food value than their meat. A hen could lay on average one egg every two days, and some peasants paid rent in eggs.

Sheep were among the most prized farm animals, and they were the most numerous in some regions. Medieval sheep were smaller than modern sheep. They could find grass on land that was not rich enough for wheat fields, including at elevations where crops could not grow. They were milked, and farmers made sheep cheeses and butter. Sheep's milk was originally more commonly used than cow's milk. They dropped manure on fields that could later be plowed and planted, and, for this reason, their folds were moved frequently, even daily. Their wool, particularly as longhaired sheep were bred, was highly valuable, and wool was the primary export of England. Once slaughtered, their meat was mutton and their skin became **parchment** for books.

During the 14th century, sheep herds greatly increased. **Cloth** production made their wool more important than their milk, and shepherds focused on lambing rather than milking. Sheep were also kept longer before slaughter, since they produced wool long past their milking usefulness. By the 12th century, some **monasteries** and manors were beginning selective breeding to produce better wool, and, by the 14th century, these new breeds had finer wool. Sheep bred by Cistercian lay brothers were the best.

In 13th-century Spain, sheep breeders created the Merino sheep with the softest wool. Spanish shepherds had to move their sheep from summer to winter pastures, sometimes over long distances. Late medieval Spain was honeycombed with sheep trails, which were maintained by the *mestas,* the sheep owners' regional organizations. The level of organization required to maintain the trails and rules also permitted organized breeding, overseen by the *mestas.* The new breed they developed was perfect for their conditions. The Merino sheep could walk long distances and it could get by on only scruffy grazing in a hot, dry **climate.** It produced large amounts of very fine wool.

Cattle were primarily draft animals and only shifted to dairy and meat animals as the horse became the main draft animal. There may have been more cattle than sheep in early medieval England. They were smaller than

modern cattle and had longer horns. A castrated male was called an ox and was the main plowing animal for most of the Middle Ages, until the 13th-century shift to growing oats made it easier to keep horses. Oxen typically plowed in teams of eight, where possible. They could be eaten when they wore out their strength in work; their other parts produced glue, leather, parchment, and fat for soap. Horses could plow faster, but the church did not allow people to eat them. Until the murrain outbreaks of the 14th century, cattle had fewer diseases than horses, and they did not need shoes.

During the 13th century's agricultural shift to three-field crop rotation and draft horses, cattle became more important as dairy cows. Males were still castrated as oxen if not needed as bulls, but barn and field resources shifted to maintaining as many females as possible for milk. Once cattle became more valuable for their milk, they were given more food and began to grow larger.

Goats and sheep were the most common farm animals in Mediterranean countries. Goats were never well established in the north, although they were kept in some places. By the 13th century, English farms rarely kept goats. In Alpine regions, goats and sheep had to be moved to winter or summer pastures for the most efficient use of scanty pasturage.

Wild hares were native to Europe, but the smaller, fatter domesticated rabbit was an invader during the Middle Ages. Monasteries kept rabbits, since baby rabbits were declared fish by the church and could be eaten on **fast** days. As monasteries made progress in raising rabbits on their farms, aristocrats introduced them back into the wild in new areas so they would reproduce for sport hunting. The rabbit came to England in 1176, and, at the same time, aristocrats introduced partridges, pheasants, peafowl, and fallow deer. Domestic and wild rabbits interbred, and rabbits easily went wild if they escaped. Although they were rare during most of the Middle Ages, by the Renaissance rabbits were a common nuisance and had displaced the native hare.

Manure from all domesticated animals was an important agricultural product that had high market value. Manure's value as fertilizer was well-known. The landowner often claimed not only the dung of his own estates and fields, but also the swept-up droppings on the town streets, which poorer people would have been glad to salvage. Street droppings swept up in London were sold to country farms. Peasants could not develop their fields as well, since they had fewer animals.

Pets

Rabbits were not only wild or farm animals. Like people today, medieval people noticed that rabbits made good pets. They were easy to feed

and did not take up much space. Anyone with a fondness for animals and enough money to produce a little spare food might keep a rabbit or squirrel. Manuscript pictures show ladies with squirrels in collars that are clearly tame pets.

Birds were also popular small pets. Today's pet birds are usually exotic birds from the Orient, but in the Middle Ages, the only exotic bird known was the parrot, called a popinjay. It was extremely expensive and very rare. Native birds could be tamed, most commonly jays, jackdaws, and magpies. Jackdaws and magpies could be trained to imitate speech. The queens of England kept cages of small birds such as nightingales, and a few had African parrots—gifts sent by foreign royalty.

North African monkeys were imported to Europe and were popular aristocratic pets. While a monkey would be beyond the means of a **university** student, who might rather keep a rabbit or bird, some ladies kept monkeys. Monkeys could be bought at large **fairs,** and traveling **minstrels** used trained monkeys in their shows.

Dogs were part of European civilization from the start, first as **hunting** dogs. Most **knights** kept hunting dogs at their manors. By the Middle Ages, there were many different breeds. Hunting required different sizes and skills in dogs: greyhounds and alaunts could catch up to running deer and pull them down, mid-sized running hounds tracked and chased the quarry, and bloodhounds tracked and killed downed animals. Mastiffs and similar dogs were used for guarding flocks. Hunting dogs were not exactly pets, since they lived in kennels, but some favorite hunting dogs were permitted to come into the **castle** hall and eat scraps. Dogs are described in bestiaries in terms similar to the modern phrase "man's best friend": dogs had been known to help solve crimes or to leap onto the **funeral** pyre of a dead master.

Ladies had lap dogs, and, in the less disciplined convents, nuns kept dogs as pets. The dogs ate table food that might have been given to the poor or used by the nuns themselves, so the **church** tried to discourage the habit. Even worse, in some places, nuns brought their pets to chapel, where they distracted everyone from the service. Aristocratic ladies kept dogs without any fear of ecclesiastical rebuke; a pet dog was a socially approved sign of wealth. Pet dogs are pictured in manuscript illuminations in different shapes and sizes; some look like small spaniels, a later popular pet of the aristocracy.

Cats were not part of early medieval Europe but became popular luxury pets in the late Middle Ages. They rate scantier mention in the bestiaries than mice. They first entered Europe's economy as small predators similar to ferrets, probably brought from the East on **ships.** Their bones are found in French towns from the 10th century, but they appear to be small and feral. As the rat population grew in towns, cats were useful town animals

to keep them in check. Many churches and businesses kept cats around for that purpose, but these were usually feral cats. Common people must often have tamed them, but they were considered low animals and were always associated with witchcraft by the church. Feral town cats might be killed for their fur, which could be passed off as fox fur if the seller were lucky. Even as cat fur, it had value. In the late Middle Ages, though, travelers began importing exotic breeds, such as the Persian cat, from the East. Exotic cats joined lap dogs as pets for aristocratic ladies, and paintings from the late medieval years show cats in settings with people.

Wild Animals

While some animals were wild but became domesticated, others were always wild. These included predatory animals like wolves, foxes, and bears and grazing deer hunted for their meat. They also included many small animals that still live at the margins of human society.

The most feared animal was the wolf. In the 7th and 8th centuries, much of Europe was covered with deep forest, and human settlements were isolated or coastal. By the 14th century, the forests were nearly gone, except for fringes on mountain slopes. Wolves withdrew to these ranges, and, where possible, they were hunted to extinction. While modern man has a sense that wolves are needed to keep the natural world balanced, medieval man saw wolves as wholly wicked. The real wolf of the forest easily became the wicked wolf of the fairy tale, since man's only contact with wolves was their fierce predation against his flocks. Medieval wolves were large enough to take down horses, cattle, sheep, and goats. In the forests, they hunted the same animals that hunters pursued. In outlying villages, older wolves sometimes killed small children.

Wolves were not valuable animals to hunt. They carried rabies, and medieval people believed their bite was generally poisonous. Their fur could make good blankets, but it had a distinctive smell that had to be removed. Because they were evil, nobody ate them; however, for that same reason, some of their parts were thought to have magical or medicinal power.

Bears were also hunted to extinction in medieval Europe, although there were always some in captivity. They may have originally been more common in Spain, where they were protected as royal hunting game. Bears were possible to tame, unlike wolves. Foxes were not tamed and were both less dangerous and more numerous than wolves. They were prized for their fur and were very popular hunting targets, as they are today.

Deer were protected in royal forests in much of Europe, so they were kept from extinction by the efforts of professional foresters. The red, roe, and fallow deer were Europe's native breeds. Fallow deer were native to the Mediterranean; they were the smallest kind. Red and roe deer were native

to the British islands. They continued to live wild, while fallow deer increased in numbers in protected forests and parks. All kinds of deer lived in the large royal forests.

Deer browsed on meadow grass and tree leaves. The medieval practice of coppicing trees produced many young shoots suitable for deer to eat. In winter, deer in protected parks were often fed hay. Their rutting (mating) season was in the fall, and they gave birth to fawns in the spring. Professional hunters were careful to hunt bucks only in the summer and does only in the fall.

Fierce wild boars, twice the size of domesticated pigs, roamed the forests and could easily kill both dogs and hunters. They were black and had very coarse, bristly hair. The wild sows were also fierce, but the boar had long, sharp tusks.

Other wild animals abounded: otters, beavers, and muskrats in the lakes and streams; hares, badgers, and hedgehogs in the fields; and weasels and lynx in the forests. In the Alps and Pyrenees, there were ibex and chamois mountain goats.

Entertainment with Animals

In addition to the rare entertainment of a king's parade of his private **zoo**—a menagerie of exotic animals—medieval townspeople enjoyed shows of more common animals. Animal fighting was a very popular spectacle for medieval peasants and townspeople. Animals could also be trained, in some cases. Trainers for dogs, horses, bears, and apes traveled to fairs and castles or stayed at a nobleman's court. Bears and dogs could both learn to **dance.** Apes could learn to juggle, ride on dogs, or work simple machines like wheelbarrows. Bears also learned to pretend to fight with actors so the crowd could enjoy watching a wrestling match.

Cockfighting began as a sport for boys in France, but it became an adult sport for betting. Medieval people believed that roosters were natural fighters, like knights, and that it was noble for them to fight each other. Cockfights were like **tournaments** for the poor. The watchers were used to the blood and injury and found fights very exciting.

The most popular spectacle at a fair was bearbaiting. A bear, muzzled so it could not bite, was kept in an enclosure or tethered to a stake. Sometimes the bear was blind. Fighting dogs were sent to attack the bear, which could only use his paws to defend himself. People placed bets on how many dogs the bear could kill before it died.

Bulls, too, were baited. In Spain, the tradition of bullfighting goes back to medieval times. Nobles fought bulls to prove their courage, and commoners fought bulls for cash prizes. In Northern Europe, bulls were baited like bears, with dogs set on them. Bulldogs were bred to have vice-like

The men watching this bearbaiting have placed bets on how many dogs the bear can kill before it collapses or dies. (The British Library/StockphotoPro)

jaws that could clamp onto a bull's nose, even if the bull shook and tossed the dog.

Animal cruelty as entertainment could take more direct forms. Schoolboys played a game of burying a chicken up to its neck and throwing rocks at it until it was dead. Some games made the normal slaughter of farm animals into gory play, such as mock jousting to decapitate a goose or a blindfolded game of beating a sow to death. A number of small wild animals, such as birds and frogs, also served as targets for rock throwing or mutilation.

See also: Agriculture, Food, Forests, Horses, Hunting, Minstrels and Troubadours, Zoos.

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Armor

During the Middle Ages, armor began as flexible chainmail tunics and only gradually developed into the **knight**'s plate armor that is more familiar in our imaginations. New spear-based **weapons** made plate armor a necessity in war, and it took center stage in the fad for **tournaments. Gunpowder** then began the process of making plate armor obsolete. The height of plate armor craft came after the Middle Ages, during the early Renaissance, when it had become a ceremonial and athletic accessory. Real war technology had moved on.

Even in the late Middle Ages, chainmail was still in use in real wars, and only a small percentage of fighters ever had a full suit of expensive plate armor. Any sort of armor was always a mark of status; low-ranked fighters had a quilted or leather tunic, at most. Leather could be hardened to be as tough as wood, and it never went completely out of use as primary armor. During the 14th century in Italy, some hardened leather armor was tooled and gilded and was used by those who could have afforded metal. It was cooler and easier to use for light combat.

In most of Europe, though, the trend was always toward incorporating the largest amount of **iron** available at the time and for the user's budget. The standard was chainmail, made of interlocked iron rings and called simply "mail." Mail was deemed good enough until two new weapon developments early in the 14th century. In Flanders and Switzerland, in 1302 and 1315, peasants and townsmen used halberds and pikes to kill large numbers of well-armed knights. The sharp point of a spear could go through mail. And, in 1346, English longbows sent yard-long arrows through French knights' armor at the Battle of Crécy. The French army had a squadron of Genoese crossbowmen, and their bolts, too, could pierce a mail hauberk. Plates were first attached to leather and then were bolted together in increasingly complete suits.

Milan was the armor-making center of Europe during the Middle Ages. Although armor was made locally in all parts of Europe, the finest armor

always came from Milan. When trends changed, they changed first in Milan. In the 1280s, the Milanese armorers began to reinforce mail with plates to block arrows at key points. By 1340, they viewed plate armor as their main product and supplementary mail as a secondary product. The wealthiest aristocrats and kings ordered armor from Milan.

Milan-trained armorers were enticed to move elsewhere, bringing their knowledge. Milan sent armorers into other **cities** of Italy: Brescia, Rome, Venice, Modena, and Naples. Around 1400, Milanese craftsmen began moving to England and France and populated Milanese shops in Paris, Tours, Innsbruck, Bruges, and Artois. In Nuremberg and Augsburg, cities of southern Germany, armor-making increased in the middle of the 14th century. German armies were pushing back a Turkish invasion at the Hungarian border, and these cities supplied the armor. Germany also exported armor to Poland.

Before its downfall as a craft in the 16th century, armor-making was big business in Europe. Merchant armorers worked with craftsmen to fill very large orders for kings who were preparing for war. A king might buy armor pieces for several thousand men in addition to his knights, who already had armor. **Guild** regulations prevented arms from being sold in large amounts on the open market so that craftsmen could retain control over their wares, but no single craftsman could fill these large orders. Determined merchants found ways around the guild rules or simply flouted them. Large multinational corporations with stockholders grew up in the arms trade.

In the 14th and 15th centuries, kings, dukes, and earls spent a great deal on armor that would stand out from the rest of their knights. Sometimes the armor was ceremonial, and sometimes it was really intended for war. The armor had **gold**-plated decorations in visible places, like on the visor of a helm, or was engraved with fine decorations on the main plates. Some armor was even enameled black with gold designs or was embedded with jewels. These gold-decorated armor pieces cost as much as the annual income of the kingdom. Most of the luxury armor came in the period after the Middle Ages proper. In the Renaissance, luxury armor was a great prestige symbol, even though it was no longer useful in war.

Shields

In the early Middle Ages, reinforced wooden shields were a key part of a warrior's kit. They were usually round, in Northern European usage. Anglo-Saxon and early Frankish round shields probably had metal rims to protect the edges from splintering as easily. It seems likely that they were painted or decorated with metal. The shield found in the rich Sutton Hoo grave had **silver** rivets and other decorative metal touches, while the

decorative shields from a boat burial in Norway were painted yellow and black directly on the wood. Shields were critical to Anglo-Saxon warfare. Foot soldiers formed a shield wall, and the strategy depended on not allowing the enemy to break through the wall.

The Norse Vikings used round, flat wooden shields covered with leather, often painted. Their purpose was to ward off arrows and some blows, but they could easily be shattered with an ax, and some Vikings ran through more than one shield in a battle. The shields were about the size of a pizza—14 inches to 30 inches at the largest. They had a hole cut in the center large enough to fit a hand. A metal boss covered this hole; it had a handgrip bar at the back. It was nearly cone-shaped, with a point to deflect blows. Very few wooden shields have survived, but many shield bosses have been found in pagan graves.

The Norman invasion in 1066 brought a new style of shield. The shields shown on the Bayeux Tapestry are large and kite-shaped, carried on the left arm. It is likely the kite shape was an adaptation to carrying the shield on horseback. From this time on, Norman knights carried shields for mounted warfare—usually some form of a triangle, narrower at the bottom where they might knock against the horse. During the Middle Ages, shield shapes changed as their purpose shifted.

Shields were made of plywood, not iron. From round Norse shields to medieval jousting shields, they began with thin layers of wood glued together so the grain of each layer was at right angles to the grain of its neighbors. Most shields were bent into a curved shape so blows would slide off. The face of a shield was covered with leather and then often with gesso, a plaster glue used to prepare wooden surfaces for painting in fine art. The shield could then be painted.

The back of the shield needed straps or handles. Norse shields had a handle bolted to the metal center boss as well as a strap for the elbow to help support the shield. Straps on the back of a shield are called enarmes. Medieval shields had leather straps riveted to the plywood to support the elbow and wrist. Some shields also had a third, small strap to hook fingers into when they were not being used. Additionally, most had a strap that could sling the shield around the neck or back when at rest. This strap was called the guige. The shield's back was covered with fabric, either linen or something finer. A pad of horsehair often padded the area where the arm rested against the shield to protect it from being bruised by direct blows.

At first, the new tactical method of cavalry charges with lances made knights carry larger, heavier shields during the 12th and 13th centuries. The shields were called targes and were covered with leather. Knights needed to take several shields, which were carried by their squires, into battle. However, this increased use of shields did not last. Shields were not used as an active part of a knight's defenses after full plate armor came into use. Some

armored knights still used small shields, but a wooden shield was not nearly as strong as the armor itself. Tournament shields still had a function since they helped support the lance. They were designed with a notch cut in one top corner to rest the lance while charging.

Shields had a second life as less personal weapons in later warfare. In **sieges,** many kinds of wooden walls and shields were needed to protect those who were shooting or operating machinery. A tall, freestanding wooden shield, called a pavis, was supported by legs and could shelter two or more fighters. Archers usually fought behind pavises. These shields were not much more than large boards.

Helmets

Viking helmets, like the helmets used by the Franks and Anglo-Saxons, were close-fitting and made of metal or leather. They did not generally have horns, but they often had nose guards. Some had cheek plates and chin-straps; they were made of several metal plates, riveted together. The few helmets that survived in rich ship burials often have totem **animals** mounted on top, like a crest.

On the Bayeux Tapestry, the fighters wear close-fitting round steel helmets with nose guards. They are fitted over chainmail hoods (coifs) that protect the neck. Under the mail coif was a padded cloth cap. This type of head protection was the most common through most of the Middle Ages. Variations were in how rounded or pointed the helmet was or whether it

The helmet of King Henry V of England is in the expensive, elaborate style required for 15th-century tournaments. Whether in battle or jousting, the knight's neck, head, and face were entirely covered. The small slit allowed vision only when the knight's head was lowered in a charge. The full helmet sacrificed visibility for protection. (Royal Armouries/David Lyons/StockphotoPro)

was made from a single plate or several plates welded to a frame. In the later Middle Ages, the simple round helmet was called, in French, a *cervellière*. It could even be worn under a larger helmet.

Later helmets were larger and flat on top. They protected the head better but restricted visibility. They had fitted leather linings that supported the helmet, similar to a football helmet. As fighting tactics changed, so too did helmet styles. There was always a trade-off between visibility and protection. Knights who were jousting or fighting in cavalry charges with lances needed maximum protection, even at the expense of visibility. Foot soldiers needed mobility and wore helmets that left the face open.

The knight's bascinet, in the 14th century, had a hinged visor that could be closed in fighting conditions or left open for visibility; one version had a hinge that allowed the visor to hang at the chin. The neck of the bascinet was covered with a plate so a chainmail hood was not necessary and the neck was better protected. This curved plate, called a gorget or an aventail, went all around the neck. Tournament helms were often beaked in front so they would turn a lance's point to the side. Closed great helms were less and less used on the battlefield.

A more practical battlefield helmet looked more like a **hat** with a brim; blows from above, such as from a mounted knight or a descending arrow, would glance off. It was used extensively by infantry soldiers during the 12th century and after. It was variously called a *chapel de fer* or war hat. It did not protect the wearer's face, but it also did not restrict vision at all.

In the 15th century, battlefield helmets still included both bascinets (especially to protect the face from arrows) and brimmed iron hats. Mail coifs were no longer used; most chainmail had fallen out of favor. Gorgets and aventails protected the throat and neck instead.

Mail Armor

A mail shirt was usually called a hauberk, but in the Norse literature, it is called a byrnie. It was the earliest type of European armor, and it defended a fighter well against sword or knife cuts. It was not a good defense against spears or arrows, which could pierce and tear the rings.

Mail was made from a fabric of interlocked iron rings. These rings were either made from iron wire or punched out from a thin sheet of iron. When they were made from wire, the process was fast. Wire was wrapped in a spiral around a rod and then cut along one side to make many single rings. The mail maker flatted the ends of each wire ring, reheating it to make it soft, and punched tiny holes in the metal. The ends overlapped so the ring could close. Wire rings were riveted with a special tool; when solid punched rings were used, they had to alternate with riveted wire rings—one riveted ring for every four solid ones connected to it.

A 12th-century mailed knight kneels to receive a blessing. Embroidered crosses on his surcote show that he is a Crusader. (The British Library/StockphotoPro)

The mail maker worked with a dummy like a dressmaker's. The dummy had a head and shoulders, at least, so he could shape the fit of the rings around these surfaces. The mail across the chest and back did not need to be carefully shaped, but a mail hood, and mail shoulders and arms, had to fit properly. Mail makers probably used written patterns that told them how many rings to put in each row and how to link the rings for the proper shape, but no patterns or guild treatises on the craft survived.

A mail hauberk alone was not enough. If the iron rings were pressed hard against flesh, they would cause their own injury, so there was always a leather or padded tunic under the hauberk. Once cotton was imported from Italy, it became the best quilt padding. During the 12th century, armor makers invented mail mittens to protect a fighter's fingers. Called mufflers, they had fabric on the palms and a slit the hand could slip through, allowing the hand coverings to dangle. Armor makers also developed mail leggings, called chausses, that attached to straps under the tunic. These, too, had to be padded with leather or linen.

In Anglo-Saxon and Frankish times, it is unlikely that the common foot soldier had a hauberk or byrnie. They were only used by elite warriors, as described in *Beowulf*. By the end of the Carolingian period, before the Norman conquest, 10th- and 11th-century soldiers were more likely to have mail shirts. A hauberk was an expensive investment, and it was passed down in families. In the 12th century, a lighter and less expensive form of mail hauberk was called a haubergeon. It did not have long mail sleeves or mittens. By the 13th century, there were even less expensive kinds of soft armor that may not have used any chainmail, only quilted cotton padding. Quilted armor types were called aketon (Arabic for cotton), gambeson, and pourpoint.

A 14th-century development from the chainmail hauberk was a sleeveless leather tunic with metal plates riveted in an overlapping pattern that covered the surface completely. It is often called a coat of plates. The plates themselves did a better job of guarding the wearer against arrow points, but the riveted joints were weaker spots that an arrow or halberd might pierce. The leather, too, could be hardened to provide some protection. The coat of plates could be worn in combination with a mail hauberk, either over it or under it. Similarly, there had been a Byzantine and Asian tradition to use lamellar armor, which used small overlapping metal plates to cover the surface of leather. Lamellar armor sometimes used hardened leather alone, which was more common in areas that were both poorer and hotter than Northern Europe.

The surcote was a linen tunic worn over chainmail. It kept the sun from direct contact with the metal, which could heat to the point of burning its wearer. The surcote was slit at the sides so it did not hinder movement. Crusaders' surcotes were decorated with a red cross. Other knights wore surcotes with their heraldic arms or the arms of the lord they served.

Plate Armor

During the 13th century, metal plate armor began with open greaves that covered the shins and knees worn under mail hauberks. Closed greaves for the whole calf came after 1300, and then came full protection for the upper leg, called a cuisse or cuish. The entire leg harness was called the jamb, and its joint plate at the knee was called the poleyn. After 1380, leg armor included the sabaton, an iron **shoe** made of narrow plates that moved with the foot. Mounted on either steel shoe or leather boot, spurs completed the knight's leg harness.

The first plate armor for the body was a cuirass, a piece made to cover the chest and back. After an original leather foundation provided its name, the cuirass evolved into a shirt made of solid pieces of iron. Below the rib cage, the armor needed to flex and bend with the body, so it was made as iron rings riveted to a leather skirt on the main cuirass. These hoops could overlap and move as the body moved. The skirt of hoops was called a fauld. In the last years of the Middle Ages and moving into the Renaissance, armorers added tassets, additional protective plates hanging from the fauld. At the shoulders, where arm protection attached, there were hinged plates called pauldrons.

Arm protection developed during the 14th century. Enclosed plates for the forearm and upper arm, called cannons, were hinged and connected by an elbow plate, the couter. The whole assembly was called a vambrace.

Pieces of armor might be hinged and buckled, or they could come in separate pieces to be tied together. Some cuirasses were hinged on the left and then buckled on the right; others were separate back and front pieces. When armor was tied in place, it was often tied with laces sewn on the undergarments. The laces were made of waxed twine and were called points. Putting on armor took time and at least one **servant**'s help.

Plate armor construction began with beating a sheet of heated iron into a thin plate, often with a water **mill** that drove mechanical hammers. Cut into proper shapes, the plates were beaten on anvils shaped like the final products. There were many different hammers, as well as different forms, and the best armor was thicker and thinner in strategic places. At some points, the metal could be hammered and worked while it was cold enough to touch; some contemporary drawings show smiths holding the pieces with bare hands. Frequently, the pieces had to be annealed; they were reheated to red hot and then allowed to cool and worked while still soft.

Fine shaping and fitting had to be done with more care. Some knights had wax models of their legs or arms made so the armor could be custom fitted for them; others had **cloth** patterns cut to their limbs so the armor maker could reconstruct their exact shape. Fine adjustments in size and curvature were then made, with the pieces frequently annealed. At this

stage, the edges of the plates were carefully fitted together or curled around to help deflect blows.

Plates were case hardened by covering the outside with charcoal and heating it to red-hot again. The iron absorbed extra carbon and became a layer of steel on the outside of the iron. If it cooled very fast by being plunged into water, it became very hard and could be polished to look like glass, but it was also more brittle. Slower cooling, or cooling and then reheating to temper it, produced the best result. The process of determining how best to harden steel led to the first industrial tests. Blades, arrows, or bullets were used on the newly made armor to prove it was strong. This was called "armor of proof," and it was guaranteed to work. The full harness was temporarily assembled, too, to check if it had been properly fitted. It was finished, but it was black, rough, and dented.

The pieces of plate armor were polished, either by hand or on a water-driven polishing wheel. The steel began to shine like glass. For luxury armor, the pieces were etched with acid or plated with gold. Finally, the master armorer finished the harness. He riveted the pieces together and riveted strips of leather to the proper edges. He riveted hinges made by a locksmith and added more straps and buckles. Many of the plates were fitted with padding. The final harness weighed around 60 pounds, comparable to a modern soldier's heavy pack.

In the 14th century, armorers developed plate armor for **horses.** The most important plate, the peytral, covered the horse's chest, which was most vulnerable to a pike or lance attack. The face was also covered with a plate that left the mouth and nose open and had eyeholes and ear covers. This was called a shaffron, and a crinnet—a curved, hinged piece—sat on the back of the horse's neck. Usually the horse's flanks were covered with leather to protect against scratches without inhibiting the horse's movement, but there were also full armor plates in occasional use. The crupper was a set of curved plates for the horse's back end, while the midsection was protected by both the knight's saddle and flanchards. The horse's armor had to sit on a thickly quilted coat so it didn't bruise the animal. There must have been great danger for the horses to overheat.

See also: Crusades, Horses, Iron, Knights, Tournaments, Weapons.

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Arthur, King

Some of the legends we associate with the Middle Ages were already popular in their own time. In England, the legend of King Arthur was extremely popular. The stories were anachronistic even then, set in a time long past but dressed in the fashions and attitudes of the High Middle Ages. They were a vehicle not only for entertainment but also for educating the aristocracy in the values of courtly love and chivalry.

The setting for the legends of King Arthur is the period when the Roman Empire was collapsing and the Germanic tribes were expanding across Europe, pushing out the Celts who had been dominant under Rome. The basic framework is that the Roman troops had left, and the Saxons had initial victories, but the Britons organized themselves and drove the Saxons out for a time. During the time before the Anglo-Saxons returned in numbers, Arthur, the king responsible for their military success, ruled his land in peace and Christianity.

Scholars debate whether a real King Arthur existed. Arthurs are listed in the Irish histories, but the details do not match the legends at all. At least one Roman with the family name Artorius came to Britain. The history of Gildas, a fifth-century British monk, told about the Battle of Badon Hill in which the Saxons were pushed back but did not mention Arthur. His military leader is named Ambrosius Aurelianus, a name without clear similarities to the name Arthur. Arthur could have been a nickname that came to mask a very different historical given name. In 1985, Geoffrey Ashe argued in *The Discovery of Arthur* that Camelot was Cadbury Castle in Somerset and Riothamus, a Romanized British general, was the true Arthur.

After the Celtic Britons lost ground to the invading Anglo-Saxons, many of them withdrew to the mountains of Wales or crossed the channel to

France, founding the county of Brittany. King Arthur emerged from the legends of Wales in the work of Geoffrey of Monmouth. Geoffrey, possibly a native speaker of Breton, the Celtic language that survived in Brittany, translated an earlier work into Latin, perhaps adding his own stories. His book was called *Historia Regum Britanniae: The History of the Kings of Britain*. In 1155, a Norman, Wace, translated Geoffrey's work into French poetry, the "Roman de Brut." Wace added the Round Table and some other flourishes.

Provençal **troubadours** took over the story from there, adding side stories and new characters. The troubadours added the romance of Lancelot and Guinevere. Arthur's story and related stories, such as Tristan and Isolde, were called "Matter of Britain" by the troubadours. Between 1170 and 1190, Chrétien de Troyes, a troubadour at the court of Marie de France, countess of Champagne, added the stories of "Yvain, Knight of the Lion," "Lancelot, Knight of the Cart," and "Perceval, the Story of the Grail" to the cycle. Around 1200, the English poet Layamon wrote the Arthurian stories back into Middle English, adding more details; he made the Round Table large enough to seat more than 1,000 **knights.** In the same period, Robert de Boron wrote some poems in which Merlin created the Round Table and made each name magically appear at a place. "Sir Gawain and the Green Knight," an anonymous poem in Middle English, was written in the 14th century.

Troubadours spread the stories, which were taken very seriously by both royalty and commoners. The authenticity of Geoffrey of Monmouth's

Winchester's "Round Table," made for a feast, soon lost its true history; people thought that it was King Arthur's actual table. (Nick Lewis Photography)

history was not doubted, and the inventions of the early period were absorbed into the assumed truth of the whole. After 14-year-old Eleanor of Provence married King Henry III in 1236, a court record suggests a trip to see Arthur's grave. Their son, King Edward I, ordered a large round table made of wood and painted with the names of Arthur's knights. It was used at a **feast** in the Great Hall of Winchester **Castle,** probably for an Arthurian-themed **tournament.** The table hung on the wall as a decoration for many centuries, long after the castle had been dismantled. In 1485, William Caxton, England's first printer, published Thomas Mallory's collection of Arthurian stories, *Le Morte d'Arthur,* translated from the French stories and songs. Mallory probably arranged the existing stories and added more of his own, playing up the Grail and including Arthur's mystical death. A year later, King Henry VII and Elizabeth of York named their first son Arthur, hoping to unite an England fractured by civil war behind the national symbolism. Later, the large round table at Winchester Castle was even taken as proof of Arthur's existence.

The stories were set in a fabled 12-year peace between the Britons and the Saxons, when Geoffrey's history placed Arthur's court at the center of the world's attention as a model of excellence. Arthur himself rarely starred in the tales, but his court at Camelot served as the framework for a series of adventures for his knights. One of Arthur's convenient traits was to grant boons without knowing what they would be so plot complications could arise. He usually insisted on an adventure before the court could feast, which formed the frame story for stories like "Gawain and the Green Knight."

The basic types of Arthurian stories concerned the Holy Grail, Merlin, Lancelot and Guinevere, and the death of Arthur. Family matters for the knights were complicated; Arthur fathered a bastard son with his sister, without knowing who she was, and Lancelot fathered Galahad with the lady of the Grail Castle. Magical ladies, such as Morgan le Fay and the Lady of the Lake, could enchant, distract, and deceive, as with the repeating character of the "false Guinevere." Arthur's death came about through an involved story in which he must condemn his queen to death, besiege Lancelot's castle, and fight against his bastard son, Mordred. Magical elements were never far off, as when a hand comes out of the lake to receive Excalibur at Arthur's death. The cycle came to a rest with Merlin in an enchanted death-sleep, Arthur carried away by Morgan le Fay, Lancelot in a **monastery,** and Guinevere in a convent.

The stories are profoundly anachronistic. Stone castles did not yet exist in the 6th century; a real Camelot could not have been more than a timber-walled hill fort. Although British, Irish, and Saxon kings had warrior bands, they did not have knights in the 13th-century sense. In the 6th century, warriors did not wear **armor,** nor did they hold tournaments. The British

of the 6th century were Christians, but the cult of the Virgin Mary and the Grail had not yet developed. Only the marriage details could be historical, since kings always married the daughters or sisters of nearby or rival kings. In the stories of Arthur, a medieval audience could enjoy a gilded version of their own world, in which everyone had noble purposes and experienced miracles.

The Arthurian cycle served a further purpose in medieval society. Arthur's knights were on the side of law and order, and they were deeply religious. They fought against ghostly demon knights who had not been true to the code of chivalry, and they opposed renegade knights who used their strength to rob and oppress. Malory's Arthurian tales state that each year, the Round Table knights had to swear not to rape women. The legend became a set of morality tales for the knights and their social class, reminding them not to use their weapons for harm. In a heavily armed society, this was a much-needed value.

See also: Castles, Knights, Minstrels and Troubadours, Tournaments.

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Astrolabe

The astrolabe was an instrument used by astronomers, navigators, and mathematicians. Its primary functions were to locate and predict the positions of the sun, moon, planets, and stars. It could be used for telling time if the user's latitude was known, for surveying, and for solving some geometry problems. A mariner's astrolabe was developed for use on a **ship**'s deck. Similarly, the armillary sphere was a globe of the stars and planets and could be used as a teaching aid, for **navigation,** and to calculate future cycles of the planets.

The first certain treatise on an astrolabe was written in 4th-century Alexandria, a scientific center of the Roman and Byzantine cultures. Knowledge of the astrolabe spread in Greek, Syriac, and Arabic, while travelers

carried them to Persia and India and west to North Africa and Spain. During the 10th century, scholars like Gerbert of Aurillac (the future Pope Sylvester) learned the astrolabe's use in Barcelona and translated treatises into Latin. Most early European astrolabes were imported from Arabic regions, but they were a standard part of **university** study by the 13th century. They may not have been commercially produced in Europe until the 15th century.

Astrolabes were made of brass. There was a hollow disk, the mater, that was deep enough to hold flat plates, the tympans. Each tympan was made for a specific latitude and was engraved with lines to represent objects in the sky as they appeared in that location. (Most astrolabes came with several spare tympans for different altitudes; these nested inside the mater's womb and could be swapped when a traveler moved 70 miles north or south.) The rim of the disk was marked with hours of time, usually on the front, with degrees of arc on the back. On the back, there was often an alidade, a sighting instrument that allowed the user to measure a star's altitude. The front had a rule, a rotating pointer. A single pin ran through the center, holding all the turning pieces together.

The rete lay on top and could rotate. It was a precision-cut sheet of brass that functioned like a star chart, with pointers to the brightest stars and circles, arcs, and lines showing the celestial equator, ecliptics, and tropics. The center point functioned as the North Pole, while the rete itself was based on the position of the stars at the South Pole. A single full rotation of the rete represented one day.

Most astrolabes had charts etched into the quadrants of the back piece, showing information needed for calculations. They could have a chart for solving trigonometry problems, since the alidade could be used for land surveying as well as astronomy. They could have data for calculating the position of the sun, the direction of Mecca, or unequal hours.

The astrolabe's chief purpose was to find stars; an astronomer could predict times of a star's rising without direct observation. In observation use, the astrolabe could measure a star's position so the astronomer could study heavenly movement. An astronomer could measure distances in the sky, such as a comet's tail or the parallax of the moon. Astrology was considered a branch of astronomical science, since it explained the "natural **magic**" of the stars. Astrologers could use the astrolabe to tell what stars were in control at the time of a baby's birth or the right times to try bleeding.

The instrument also told time, and it showed how to convert between the unequal hours used by common people and the exact equal hours of science. Mosques used astrolabes to calculate the correct hours of prayer, although Christian churches did not look for such precision in prayer hours. Surveyors used astrolabes to solve trigonometric problems related to the height of buildings or the distances between places they could not measure

The astrolabe was the first instrument to represent both time and space as a circle divided into 24 units. (Brian Maudsley)

directly. Medieval surveyors could now measure the heights of mountains and the distances between their peaks.

The principle of the astrolabe led to an early step in the development of the **clock.** One early clock, made around 1330, was essentially a star map rotating behind a fixed rete. The idea of a rotating hand moving around a marked dial led to the first clock faces.

Armillary spheres were among the earliest complex mechanical devices. The armillary sphere was built as a model of the universe. It consisted of a set of graduated, interlocking brass rings (Latin *armilla*) that represented the circles made by the sun, the moon, the known planets, and some stars as they seemingly revolved around the earth each day. Rings also showed the equator, the earth's poles, and the tropics of Cancer and Capricorn, which mark the farthest points north and south at which the sun appears to be directly overhead. The 12 signs of the zodiac also are marked on a ring. At the center is a globe. During the Middle Ages, the armillary sphere was geocentric—that is, the central globe was the earth, with the rings showing how the sun, moon, stars, and so on all presumably revolved around the earth.

Armillary spheres were developed by the Chinese and the Greeks. It is not known with certainty which culture was the source of Europeans' knowledge of the spheres. During the Middle Ages, however, armillary

spheres became both more common and more sophisticated. There were four main ways they were used.

Navigation was one important use of the armillary sphere. Sailors could use it to determine both what time it was and what latitude their ship was sailing on. It was used in astrology, to study the presumed connections between the heavens and events on earth. For example, people studied how the stars and planets were aligned at the time of the **plague,** hoping the next outbreak could be predicted; the medieval assumption was that certain alignments corrupted the air on earth. The armillary sphere was used to teach astronomy in universities, since the rings could be moved to demonstrate time and seasons. Similarly, church officials could use the sphere to calculate the dates of Easter. Easter was supposed to be after the first full moon after the spring equinox.

See also: Clocks, Compass and Navigation, Maps, Ships and Boats.

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B

Babies

The two important events in a medieval baby's life were live birth and baptism. Infant mortality was high, and just surviving birth with a live mother was a significant achievement. Medieval people were sure babies who died unbaptized could not go to heaven, so an infant in danger must be baptized quickly. It is impossible to calculate infant mortality in medieval Europe because of inadequate record keeping, but as many as a quarter of babies may have died in their first year.

Babies were born at home with the help of a midwife and the mother's female relatives. Medieval society considered male doctors for women to be a scandalous idea, and some women may have given birth alone rather than let men assist them. When the baby was born, it was washed, sometimes in wine. In much of medieval Europe, babies were tightly swaddled with their arms and legs held straight. It was believed that the infant's limbs needed to be straightened for the first few months or their bones would grow crooked.

Medieval baptism meant the official naming of the child, as well as a ceremony that moved the child into Christendom—the kingdom of those who had been christened, another term for baptism. Babies were baptized early in their lives, often within a week, and not usually later than a few months. Baptism took place in a **church,** and the baby was presented for baptism by relatives or friends who stood in the place of the parents and made promises on the baby's behalf for living a Christian life. The baby's mother had no official role in the baptism because she was not permitted to come to church for six weeks.

A baby boy required two godfathers and a godmother, while a baby girl had two godmothers and a godfather. The godparents could not be relatives of any close degree, and they could not be drawn from families the baby might eventually marry into, since the church considered the godparent relationship as one that prohibited **marriage.** When the father was a member of a craft **guild,** a fellow guild member often became a godfather. Sometimes the lord of the manor stood as godfather.

The priest immersed the baby entirely in water three times while speaking the ritual words in Latin, *Et ego baptizo te in nomine patris, et filii, et spiritus sancti.* The priest drew a cross on the baby's head with holy oil, and the baby was wrapped in a hooded robe that covered this oil cross. Godparents usually gave the infant a gift of money. Especially toward the later Middle Ages, the priest recorded the christening in a parish **records** book.

Names went through a shift during the Middle Ages as people moved from names in their native language to names from church tradition. The Germanic tribes who spread over Europe at the close of the Roman period used names like Edward, Frederick, Richard, Henry, Robert, William, and

A wealthy household's servants tend to a woman in childbirth, the newborn baby's washing and warming, and the baby tucked into a cradle. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

Raymond or, for girls, Matilda, Emma, and Ethel. Names like these were the most popular until Christian culture grew strong enough to influence a shift to Bible names, **saints'** names, and names derived from Latin: John, Matthew, Stephen, Peter, Paul, Benedict, and Bernard for boys or Joan, Elizabeth, Mary, Katharine, Agnes, Margaret, and Clara for girls. Naming traditions for babies varied across Europe, as they still do. Children were named for parents, grandparents, and godparents, or they were named for the saint on whose day they were born.

Swaddled babies were usually tied into cradles for much of their early months. Some cradles hung on a wall, which kept the baby out of the way of people and animals. Some cradles were on rockers that could be moved with a foot. The richest mothers did not care for their own babies, but hired wet nurses to breast-feed for them. Books about child care, aimed, of course, at these wealthier families, emphasized care in selecting a wet nurse, whose physical strength and character might be imparted to the baby.

In later medieval times, the range of baby equipment increased. Babies had special **clothing,** dishes, and **furniture.** They wore shirts, caps, dresses,

hose, and, of course, diapers that were probably wool or linen rags. Washing diapers was mostly a matter of boiling the rags, and the children of the poor were probably not very clean. After they outgrew their cradles and began to walk, some babies had wooden frames with wheels, similar to modern walkers. Some people made padded baby bonnets as crash helmets for beginning walkers. Babies had simple toys such as rattles. Since infancy was thought to last until the age of seven, medieval people counted dolls and marbles as babies' toys.

Medieval rules of diet did not permit babies to have a wide range of **food.** Doctors believed most foods would make babies sick, and they received only the blandest food. Most babies lived on a diet of milk and bread and possibly prechewed meat. One 13th-century book suggested peeled, cored apple was a safe food for an infant and also recommended boiled eggs, both soft and hard. At early ages, children began to drink ale, since it was cleaner than **water.**

See also: Beverages, Church, Clothing, Food, Games.

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Banks

Banks were slow to develop in the Middle Ages because the Catholic **Church** declared it a sin to profit on lending money. The reasoning was that a man could lend money, but he could not charge for the time of the loan, since time was a gift from God, and everyone had equal time. Time was not a commodity, according to the church. Yet if time itself could not be a commodity, international commerce could not develop. During the Middle Ages, three very different classes of people found ways around the problem.

The origin of modern banking lies in the need to exchange currency while traveling and trading. **Coins** were regional and even local but were based on the **silver** penny for most of the period. The standard set by Charlemagne became the standard for his Anglo-Saxon peers such as Offa, king of Mercia. The basic equivalency of pennies and deniers and shillings and solidi helped make trade across national lines easy. By the 13th century, however, the wealthy cities of Italy were striking **gold** coins. Florence's gold coin was the florin, and Venice's became known as the ducat.

These coins became new international money standards, especially since the larger money unit of England and France, the pound, did not exist as a coin, but only as a **weight.** Florins and ducats were currencies of much higher value than pennies. Exchanging these currencies in trade meant someone needed to keep on hand large sums of the local currency to exchange for foreign coins. Coins created another problem for the increasingly large volume of international trade. Bringing enough cash to buy and sell in another **city** meant carrying large chests of silver or gold that could be stolen.

The first international banking system was run by the Order of the **Knights** of the Temple. This order of fighting **monks,** established in 1118, aimed to keep the passage to the Holy Land safe for **pilgrims,** but many wealthy people donated land and money to them, and they soon became very rich. Individual members did not use the money for themselves, but money piled up at Templar **castles** and became a private banking system. Templar castles were safe repositories for treasure, and the monks were sworn to poverty and honesty.

The Templars performed three basic banking functions. They guarded and managed money for some lords and kings, made loans, and exchanged currency for travelers. A merchant could give money to a Templar office in France and then travel to Jerusalem and receive his money in the local currency, without the danger of being robbed along the way. The Templars charged an exchange fee for this service.

King Philip the Fair of France pressured Pope Clement to outlaw the Templars in 1312, and he oversaw the trials of prominent Templars who were accused of exotic practices and crimes. Temple lands and money went to the Order of the Hospitalers, and some to King Philip. The private banking system of the Knights of the Temple disbanded.

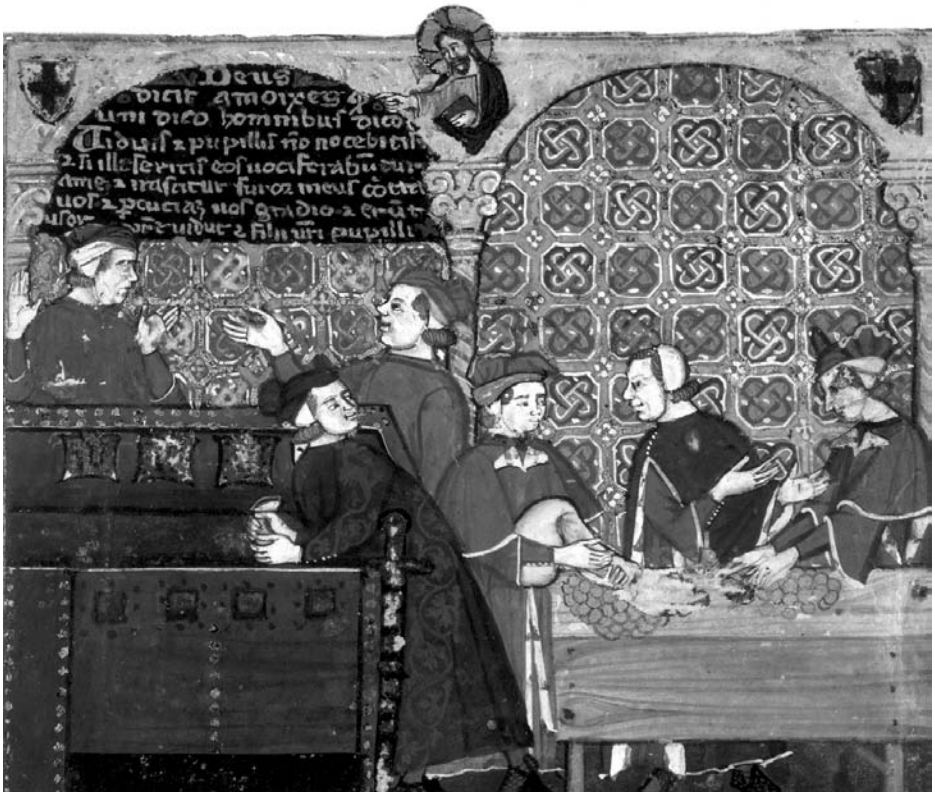
International merchants had been carrying out the same banking functions among their own branches, and, during the 13th century, they began to offer these services to others. Like the Templars, branches of Italian shipping companies had cash on hand and could issue letters of credit for a traveler that could be cashed at another branch office. **Jewish** merchants operated a similar network among themselves. Their services began to include short-term loans that covered the purchase of goods and could be repaid in another city when the goods had been sold.

The concept of lending as "the sin of usury" originated in **agriculture.** When poor farmers borrowed until the next harvest cycle, high rates of interest contributed to drive them further into poverty. The church ruled that this was a sin among Christians. International trade, however, depended on lending not as a means to drive people into greater poverty, but as a way to purchase shiploads of merchandise like **spices** and sell them at a profit. These borrowers could afford to pay for time as a commodity so

that both trader and lender profited. They had to find a way around the church's rule.

Letters of credit and bills of exchange solved the problems of carrying coins and finding loans. Letters of credit, sold by merchant bankers to travelers, could be redeemed for coin at another city's office of the same merchant bankers. As merchants in a city began to keep money deposited for safekeeping with one merchant banker, they could also request payments to other merchants; these payments were deducted from their credit account so that no money changed hands directly. The merchant banker could subtract a fee for the service of the letter of credit.

Currency exchange was another method of dodging the rules against usury. When changing silver deniers to gold florins, a banker had to make judgments as to how many deniers a florin was worth. Within this judgment call, there was room to disguise a fee. When the currency was borrowed in deniers and repaid six months later in florins, the banker could pocket an interest on the loan without appearing to be a usurer.



The word *counter* for a wide table or shelf in a store comes from the use of such tables to count coins in medieval counting houses. (The British Library/StockphotoPro)

Some Jewish merchants had already been acting as bankers not only to merchants but also to kings. Church law did not apply to them, and civil law did not forbid interest on loans. Jews did not charge interest to each other, but they did lend at interest to Christians. They became known as sinful usurers, but they were tolerated and encouraged by kings who could borrow from them in preparation for war. Jewish bankers were often unwilling participants in these loans. While **cloth** merchants would repay a loan, kings often did not. In England and France, Jews were at times stripped of their possessions and evicted partly so the kings did not have to repay on loans. Even when the law merely regulated Jewish lending without dispossessing them, there was often discrimination. An early 13th-century French law specified that Jews could not charge more than a few pennies per pound of loan. Discrimination was part of medieval life.

The Italian merchant bankers developed banking almost to a modern level of complexity. Political instability in 13th-century Italy had encouraged merchants to develop structures that permitted them to trade in other regions without leaving home. The cloth manufacturing of northern Italy grew to be organized in family-controlled companies with branches in more than one city. Instead of one individual making investments, contracting debts, and overseeing operations through paid agents, these companies were composed of members who shouldered the tasks together. At first they were relatives within a family but came to include outsiders who could invest money as shareholders.

The Italian companies were represented at the large fairs of Northern Europe, such as Champagne, Frankfort, and Cambridge. They worked with letters of credit and currency exchange at the **fairs.** Some deals were paid for in credit at the fairs. The Keeper of the Fair would notarize a "Letter of the Fair" that stated the terms of the exchange with a promise for future payment. This notarized letter could be used as further currency for another deal, sold as payment to a third party. Interest rates were fixed by law, even when they were for currency-exchange services. At the Champagne fairs, no more than 15 percent could be charged as a currency-exchange fee.

The 14th century, filled with famine and **plague,** put an end to the large, profitable Italian companies. Most were bankrupt by 1400. In the 15th century, there was a movement in Italy to create an institution to cushion individuals from the instant poverty of sudden inability to pay a debt. This was called the *monte di pieta* and was promoted by a Franciscan friar. He wanted the wealthy to donate to this fund to lend money to those who needed small loans for businesses. Town governments also devoted some tax money to the *montes* when they established them. Borrowers left valuable objects as pledges when they used these community lending services.

Accounting Methods

Tally sticks were the earliest type of loan accounting. A stick that could be split was carefully notched to show the sum being borrowed by a merchant or a government. The notches were wide enough to go well across the stick; the stick was split down the middle so both halves showed the marks of the notches. The lender kept the larger piece, called the stock, and the borrower kept the shorter piece.

Another way of counting sums, a sort of manual cash register, was the counting-board, called the exchequer. It was a wooden platter with a rim around it, covered with linen and chalked off into a chessboard pattern. Coins, or coin stand-ins called jetons, could be added in columns. On a French counting-board at a large Champagne fair, there was a column for the smallest unit of money, the heller. The next column stood for sous, and then pounds, 20 pounds, 100 pounds, and 1,000 pounds.

During the 13th and 14th centuries, Italian companies developed new methods of accounting. Merchants had always kept track of money received or paid. The original, primitive method of making notches or marks on a stick had given way to **paper books,** but the entries were written in a single column. Although an accountant could use the record to calculate the business's value at any time, it was difficult to sort the types of entries. By entering debits and credits in separate columns, an accountant could keep a running sum of the business's capital on hand and its value in purchased supplies. At first, these entries were kept on facing pages—a system developed in Venice. Gradually, the entries were kept on the same page using a double column, the way simple accounting is done today.

During the 14th century, accountants converted to the Arabic numeral system used in modern times. Some Italian merchants had converted to Arabic accounting as early as the 12th century because they had warehouses in North Africa. Leonardo of Pisa, known as Fibonacci, learned accounting with Arabic numerals in the late 12th century by working at the family's warehouse in Bougia, North Africa. However, Italian city governments were afraid the new numbers were easier to doctor in account books, and they outlawed them around 1300. By 1400, many accountants were using them anyway, and by 1500, they were universally adopted.

See also: Coins, Fairs, Gold and Silver, Jews, Numbers.

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Barrels and Buckets

Many of the **kitchen utensils** and containers in a medieval **house** were made of wood. This was especially true in Northern Europe where oaks were common native trees. While Mediterranean craftsmen made many household containers of **pottery,** English, French, and German coopers perfected the barrel. English coopers formed their own **guild** around 1300, but coopering was a skilled craft going back to pagan times. Some ship burials, including the best known at Sutton Hoo, preserved barrel hoops and even whole barrels and buckets.

Milking buckets were made by coopers and had one stave standing up higher than the rest as a handle. Water buckets needed handles or some way to fasten to a shoulder yoke. Kitchens kept barrels for storing flour and wooden vats for pickling and ale brewing. Milk was churned to butter in a narrow barrel fitted with a lid—the butter churn. Another wooden tub made cheese. Most houses used wooden bowls and wooden tankards. Clothes washing used wooden tubs, sometimes an ale barrel cut in half. Bathing required very large tubs that were also made by coopers using barrel techniques. Commercial bathing tubs were the largest domestic-use barrels, since they could fit several people. All large vats and tubs had two staves standing up higher than the rest as handles, with holes to allow a pole to slide through and raise them up.

Barrels were made in straight and bulging forms for different purposes. The basic craft is the same; it involves shaving wooden staves so they will fit together in a circle without gaps. When the shape is straight, as in a butter churn, the cooper binds them tightly together with wooden or **iron** bands and fastens a top and bottom. The wood does not need to be bent, only to be shaved along its edges so it will fit into the circle. Wooden buckets and tubs were made this way, and they made up a large part of every household's containers. The traditional name for coopers who specialized in buckets and tubs was white coopers because so many of their articles were used for milk and cheese.

Barrels were used to ship not only ale and wine, but also oil, soap, and tar. They were used to ship **coins** from the mint. They shipped eels and some other kinds of **fish,** chiefly salted herring. The herring trade in northern Germany kept hundreds of coopers at work.

Dry coopers made barrels and casks for shipping dry goods such as flour, **gunpowder,** and fish. Some of the barrels had to be watertight, such as for fish brine or soap, but others were only intended for transporting goods

and did not need to be made with care. These barrels used the cheapest wood and thin staves that bent easily.

Coopers needed more care and skill to make barrels that bowed outward in the middle and were watertight. They were known as wet coopers; their barrels were made of the thickest wood and took much longer to make. Alcoholic liquids were always put into thick barrels that could withstand the chemical pressure of fermenting gasses. While many kinds of wood could be used for other types of casks, those intended for wine and beer were nearly always oak.

The cooper cut his staves and shaved them to taper at the ends, to have slanted edges, and to be hollowed on one side. He also cut notches on the inside surface at both ends. When his staves were ready, he used an iron hoop to make the staves stand up in their first circle formation. If he had cut and shaved them correctly, they fit tightly into the hoop. Wooden hoops held the staves in place, and the wood had to be softened with boiling water or steam. Then the cooper and his assistants placed a basket of fire inside the

Barrels came in sizes specific to the wine, ale, or beer they contained. A good wine cellar had many different barrels, butts, pipes, and casks.
(The British Library/StockphotoPro)

barrel, and, as the smoke poured out the top hole, they hammered wooden and iron hoops onto the staves, forcing the barrel to curve around the tapers of its staves. The staves heated and dried as they hammered, but if they had been made well, they bent and did not split. When all the hoops were in place, the barrel's curved shape was finished.

The cooper then shaved the barrel smooth inside and out; a rough inner surface collected bacteria and made ale spoil unless its alcohol content was high. He made the flat end covers (heads) by pegging staves together with wooden dowels into two small solid boards. He cut them into the proper-sized circles to fit into the ends of the barrel and shaved them to have the correct angles. The curved staves were now dry and would not change their shape if the iron hoops were removed, so the end hoops (called chimes) were loosened to let the round heads into their places. One by one, they fitted into the notches cut in the staves' ends. A finished barrel had all of its iron hoops hammered tightly into place. A well-made wine or beer cask could be used for 50 years.

The last step was branding the barrel, no matter what size or purpose it was meant to serve: bucket, churn, wine tun, ale firkin, or beer barrel. Every cooper in the guild had his own branding iron to mark his barrels. When a cooper died, his iron was immediately taken to the guildhall so nobody could forge his mark on substandard barrels. It was illegal to use unmarked barrels—since no cooper had certified their legal size, they were usually too small.

Barrels came in all sizes, and they had different names. Hogsheads, kegs, butts, barrels, firkins, pipes, casks, tuns, and kilderkins were specific sizes that were used in certain industries. Sweet wine was sold in butts, small barrels holding only 18½ gallons, or in pipes, which were larger. Ale came in 30-gallon barrels and beer in 36-gallon barrels, the size that is most common today. Most wine came in casks, if not the larger wholesale tuns.

Since the industries that used these containers could not independently measure the amount of liquid they poured in, they trusted the coopers to make them correctly so customers would not be cheated. When coopers used green wood, over time the barrels shrank and became illegal measurements. By the middle of the 15th century, officials outlawed the use of unseasoned oak. Coopers were permitted to recycle old barrel staves as long as they had not contained anything noxious like tar, soap, or oil. When barrels wore out, coopers were able to fix them.

Beginning in the 13th century, German coopers along the Rhine River began competing to make the largest cask. It became a tradition, and the final record was not set until the 18th century with the Heidelberg Tun, which used more than 100 oak trees.

See also: Beverages, Hygiene, Kitchen Utensils, Weights and Measures.

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Baths. *See* Hygiene

Beekeeping

Beekeeping was a very important task in Europe's Middle Ages, since honey was the only good sweetener until **sugar** began to be imported. Sugar remained extremely expensive, and honey, though mostly used by the wealthy, was the only sweetener common people could even hope to taste. Beeswax was the only wax available for candles or for lost-wax casting of metal, so it was equal to honey in importance. Keeping bees means capturing wild hives and placing them in man-made structures, harvesting honey and wax, and knowing how to care for the bees' welfare.

When honeycombs are removed, the beekeeper must extract and clean the honey and wax. A honeycomb's many cells, filled with honey, are capped with more wax by the bees to seal each hexagonal cell. In harvesting the honey, the keeper must slice off this layer of wax and then drain the honey into a pot. Modern beekeepers use a centrifuge to extract all the honey from the wax cells, but in the Middle Ages, gravity was the only tool used—the honey drained off, leaving behind the wax. The honey was then strained through cheesecloth to remove dead bees or dirt. Good honey was clean; Charlemagne's estate instructions specifically directed that the highest standards be followed in processing honey, wax, and mead.

In early summer, bees often swarm, which means that a group of bees suddenly leaves the hive and flies, with a queen, to a new location to build a new hive. Beekeepers learned how to predict when a hive of bees was going to swarm by observing the queen's activity. Most early bee observers assumed the very large bee that never left the hive (except to swarm) was a male and referred to it as a king. They assumed the worker bees were females. The first description of bees that correctly called the large bee a female and the workers males was published in 1586, during the early Renaissance, in Spain. All through the Middle Ages, the largest bee was known as the king.

A beekeeper who wanted to control the location of his hives needed an artificial hive for the bees to accept as their home. He also needed a basket to trap the hive in; baskets were most often made of wicker, a woven net of pliable branches. He might use a smoky torch to sedate the bees, and, by the late Middle Ages, some beekeepers were using light **cloth** hoods and masks to protect themselves.

On the right, peasants capture wild bees in a tree; on the left, they remove honey from combs in wooden boxes. (Vatican Library/The Bridgeman Art Library)

Southern Europe had already developed traditional methods of keeping bees by the Middle Ages. Each region had its traditional form of hive. The most common forms were wicker covered with mud, **pottery,** or boxes made from wood or cork. Wicker hives, most often shaped like cones, were called skeps. Each needed to have a hole for the bees to go in and out and a larger hole for the beekeeper to use. The bottom of a conical skep was left open so the keeper could turn it upside down and access the honeycombs. A box hive had a hinged side or lid, and it often had removable shelves for the bees to use. Pottery hives kept the bees cool during a hot summer. The ends might be left open and then covered with a board until the beekeeper wanted to access the hive.

Beekeeping was well developed in Italy by the early Middle Ages. Beekeepers used both horizontal box hives and conical wicker skeps, but, by the 13th century, they began to favor boxes because they could be designed for access from both front and back. If the bees' entrance hole marked the front, the back was where they stored their honey. But when they were raising new queens, these tended to be kept near the front. A keeper would want to open the back for honey and the front to observe queen activity.

Some keepers moved the growing queens so they could control when and how the hive formed a new swarm.

In Northern Europe, bees needed help to survive eight months of extremely cold temperatures. Beekeepers in Sweden used different natural materials, such as straw and bark, to insulate their hives very thickly in September, and those in warmer places that still had harsh winters did the same. However, it was also common practice to harvest honey in the fall by killing many of the bees that would have needed the honey as their winter food. A good beekeeper was active collecting new swarms in early summer and then identified the less viable hives in the fall and smoked the bees to death. This allowed him to harvest their honey while leaving full honeycombs for the hives chosen to winter over. Insulated in their hives and with a full provision of honey, these bees could survive anywhere except close to the Arctic Circle. Bees in Finland, northern Sweden, and all but the southern tip of Norway were not able to survive or become established in the environment.

In France, Denmark, the Netherlands, and England, the traditional beehive was a conical skep made from wicker or straw that had been bound into long ropes and then coiled and stitched into a cone. The interior of the skep might include sticks to support layers of honeycomb. Honeycombs could be cut, with a knife, from one side of the skep. But it was harder to take honey from inside a coiled-straw skep as compared to a Mediterranean box with a hinged lid. If the bees were not to be killed in the winter, the other technique was to force the swarm to move into an empty hive in the middle of the summer, leaving their honeycombs behind. Skeps were kept small so bees could be easily divided this way.

In the heavily forested northeast of Europe—Germany and Poland—some keepers either tended the bees inside their original tree, by placing a door on the tree, or cut the section of trunk that included the hive and carried it home. The section of trunk became the domestic hive. The trunks were carved out for back access, with a bee hole in the front. Large trunks could contain more than one compartment. In some regions, they were placed vertically, and in others, horizontally. Honey removal was easier with a horizontal trunk hive. In order to remove honey from a vertical trunk, the keeper had to subdue the bees with smoke, though not enough to kill them. In late medieval Poland, beekeepers began carving the trunks into decorated shapes, such as women with large skirts. In these areas where bees were traditionally kept in log hives, skeps made from coiled straw were a later innovation, coming at the very end of the Middle Ages or later.

One of the problems inherent in beekeeping is that the bees do not stay confined on their owner's land, the way sheep do. While the owner may keep the hive on his land, the bees will go far and wide, using the flowers of others. Medieval customs and regulations recognized the problems that went with rights over beekeeping.

In some places, peasants could keep bees that ranged across their lord's lands, but they had to pay a type of rent in honey or wax. Higher-class renters also paid rents to landowners with honey. A lord could expect to receive a large amount of honey from his estates, as his many tenants turned over honeycombs.

Most regions and towns regulated beekeeping in some way, recognizing that bees not only had value to an owner, but also added value to the countryside by pollinating plants. A town might grant beekeeping rights over adjoining wild lands to a man or a family on the condition that they give half the honey to the town and maintain beekeeping on the land or sell it to someone who could keep it up.

Sometimes, beekeepers stole swarms of bees from each other by luring a swarm to nest on their land. Some kingdoms punished people who baited empty skeps with fines of twice the value of the bee swarm they lured in. If a man's bees swarmed and moved into a neighbor's land, and he followed them, he could identify them as his swarm and either keep them there or bring them home.

Bees might also injure people or animals. By the late Middle Ages, some local laws required beekeepers to fence away their hive areas and to pay heavy fines for animals that were stung to death if the fences were not strong enough to keep the animals out. A person injured by bees could also receive compensation from the owner, usually a measure of honey.

Most beekeeping was done on a small scale as part of other farming, but there were also large beekeeping operations. **Monasteries** kept bees on a large scale, and some farmers devoted themselves to beekeeping to the exclusion of most other farming. Large-scale beekeeping meant upward of 100 hives, which would be a full-time job.

Beeswax was very important to churches because they used candles as part of worship. Monasteries were some of the largest beekeepers, and, in many parts of Europe, secular beekeepers were required to give some portion of their wax to the local **church.** Churches were the biggest buyers of wax; the value of wax rose when a region converted to Christianity and fell following the post-medieval Reformation with its emphasis on simpler worship without candles.

Both honey and wax had high values relative to their volume and weight, so they were popular as bartering currency. Wax was also used for fees or tributes in some places. Conquering peoples such as the Vikings and Tartars accepted beeswax as part of their tribute.

Honey was commonly exported from the earliest medieval times, particularly to places where beekeeping was less common, as well as to towns. By the era of the Hanseatic League, there were regulations for honey. Dishonest honey producers might mix flour or other substances into the honey to stretch it, sell it in a dirty condition, or pad the inside of the container

so it did not hold as much as it appeared to. One reason for craft **guilds** in honey or wax was to ensure the products that came from that region were clean and pure. At the very end of the Middle Ages, beekeepers in the Netherlands organized into a guild, as did some wax candle makers in England.

See also: Agriculture, Food, Lights.

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Beer. *See* Beverages

Beggars

A medieval **city** might have as many as a quarter of its people living in a state of extreme poverty, including peasants who could not make a living and those whose work was very marginal and paid too little to support them. **University** students were often too poor to support their studies, and some towns issued begging licenses to them and allowed them to receive alms.

The poorest people in medieval society were often sick or disabled. These included cripples, lepers, the blind or deaf, and the mentally ill. Some rented a privileged space next to the **church** door or were permitted to build a small shelter by the church for a few pennies a year. They asked for alms as people passed.

Leprosy was a disfiguring disease that began with red skin and a hoarse voice. The skin became covered with sores and swellings until the person was not recognizable. Nodular leprosy mostly attacked the face. Other forms made fingers and feet rot and fall off. Leper skeletons show that not only the skin but also the bones were disfigured. It is possible that several different diseases were all called leprosy, including syphilis.

Some lepers were cared for in colonies by monks, but others were permitted to beg. They had to wear special **clothing** and ring a **bell** or rattle a clapper. People could only give them things by stretching the items out on poles to drop into the bowls lepers carried. Lepers were not permitted to touch anyone's skin. They had to walk in the gutter of the street and step aside when anyone needed to pass.

A leper woman, with a disfigured face and amputated limbs, rings her warning bell. (The British Library/StockphotoPro)

Wealthy people and **monasteries** gave alms to beggars, usually directly in the form of **food.** Often, the household's almoner, in charge of alms, collected food scraps and used trenchers made of stale bread.

Towns began to register beggars and other extremely poor paupers and gave them a limited amount of help. Each year, a pauper would receive a pair of **shoes,** some clothing, and a set amount of basic foodstuffs like bread,

oil, and herring. The clothing a town's paupers owned was usually in solemn colors, since frequently the garments were bequests from wealthy citizens for taking part in the prayers and processions for their **funerals.** The prayers of paupers were considered more meritorious, so beggars were often included in these processions and had to be dressed for the role. This custom made the official poor stand out, since citizens who could buy their own clothes preferred red, green, and blue.

In the 15th century, a new form of provision for some paupers came about, based on the transition of **hospitals** to caring for the sick. Wealthy donors built cottages, often under a single roof, like a modern townhouse. They were called almshouses, and the donors specified a particular purpose. Some were for the widows of craftsmen who had belonged to a **guild;** some were for paupers who shared the same surname as a donor. The pauper's appointment to a cottage came with a small stipend and a requirement to pray for the donor's soul. In many cases, the residents were required to wear robes of a certain color, such as red or black.

See also: Cities, Funerals, Hospitals, Medicine.

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Bells

Church bells and town bells were the most characteristic sounds of medieval Europe, and, in some places, they were the only man-made noise ever heard, apart from the pounding of hammers. Churches and **monasteries** used bells to ring the hours of prayer and to call people to Mass. Bells rang to announce a death, and a procession of mourners with handbells followed the deceased to the grave. Certain **holidays** required more bell ringing; on Easter, the bells rang at sunrise. Every town had a bell tower for calling out summons and alarms. Bells rang when towns rose up in rebellion, and belfries were torn down as a symbol of a rebellion's being crushed.

Bells were made by brass founders, who became more specialized as bellfounders as the centuries passed and more churches were built. They used the same lost-wax technique they used to make brass basins and pots, but usually on a much larger scale. Bell design was primitive during the Middle Ages, since the physics of acoustics had not been developed. The basic design of a bell was known, but nobody knew how to shape a bell to produce a certain tone. Compared to modern bells, medieval bells were taller and thinner.

Most medieval bells have been melted and recast, but the Torre del Mangia tower in Siena, Italy, still has a 14th-century bell. It is narrower than modern bells. (Alex Gore/ StockphotoPro)

The individual shape and sound of each bell was part of its value. People learned to recognize the voices of individual bells in their **city.** Moderate-sized towns usually had three bells—the great bell, the council bell, and the gate bell. Larger cities used more bells for other messages, such as bells for alms, bells to remind people to sweep the streets, bells for **universities** and **schools** to signal their opening and closing, and individual bells for opening and closing specific markets and gates. The largest bells hung high in the **cathedral** and could be heard for miles around. Bells developed names, in some cases. Venice's Cathedral of San Marco had four bells: the Marangona, the Nona, the Mezza-Terza, and the Trottiera. By the 14th century, the bells rang individually according to a set schedule to regulate the commercial day. Signals were differentiated further by different patterns of ringing for different kinds of alarms or announcements.

Large towns had to regulate the proliferation of bells. Town governments needed to keep just a few bells as the loudest so they could be counted on to signal alarms. The largest, most established churches wanted to maintain their monopoly on having the largest bells that could be heard the farthest away. Every new belfry required a charter and provided an opportunity for restrictions. In 13th-century Arras, churches built by the new mendicant friars were restricted to small bells that could be managed by just one man pulling on the rope. Their belfries had to be wooden and much shorter than the main churches' **stone** belfries, since tall towers permitted sound to carry.

The traditional lost-wax technique began with a clay form made in the shape of the inside of the bell. Using warm wax, the bellfounder then built

up the shape of the bell over this form. For a large bell, many pounds of wax were required. Then, very fine clay was applied over the wax bell, followed by coarser clay to form a strong mold. When the clay had dried, the bellfounder needed a very large oven to bake it. The wax melted and ran out holes that had been left in the bottom of the mold.

When the clay mold was baked, the laborers dug a pit large enough to hold the bell mold; often there was more than one mold. Brass, an alloy of **copper** and tin, had to be melted in a crucible. Using some kind of crane, the bellfounder poured the melted brass into the hole left at the top of each mold. After the brass had cooled, the clay was cracked and broken off. The brass bell could be lifted out of the pit and polished. Toward the late Middle Ages, bellfounders began to develop ways to carve the inside of the bell to improve its tone.

The bell had to be fitted with a way to hang it and a way to ring it. Medieval bells had brass loops called canons welded on top so that **iron** straps could nail them to timbers in the roof of the bell tower. Inside the bell, there had to be a loop to attach the clapper, which was usually made with a hook at the top. The clapper had a ball of some kind at the bottom that rang the bell by striking it. Toward the later Middle Ages, bells were usually fastened to a portion of a specially made wheel. When bells were mounted, ropes over the tops of the wheels allowed a bell ringer below them to sway the bells back and forth.

Early bellfounding was often carried out in **monasteries.** Some early monks became expert bell-founders, and early saints such as England's Saint Dunstan were known to have cast bells. In cities and large towns, brass founders could set up permanent bell foundries, but even in cities, bells alone could not keep brass foundries in business. They usually cast brass pots as well, and, with the introduction of **gunpowder,** bellfounders were the first to make brass cannons. In the country, itinerant bellfounders came by appointment and organized peasants and townsmen to carry clay, dig pits, and do other chores as the bellfounder directed.

Smiths made small jingle bells from copper and tin. They were round and trapped a ball inside with spokes at the bottom bent to keep the ball inside. Bells like this hung from **horse** harness and **minstrels' hats** or belts. Illustrations suggest a fad during the 14th century for people at court to wear bells on their girdles.

See also: Cathedrals, Holidays, Lead and Copper, Monasteries.

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Beverages

Water was not much used except by monks and the poor, mostly because it was often contaminated. It could be mixed into wine to disinfect it, but water was rarely drunk plain by anyone who could afford ale. Tea, coffee, and juice did not exist yet; tea and coffee came from exotic plants that had not yet been imported to Europe. Milk was used to make butter and cheese, and while farmers, children, and the sick may have drunk it, it was not a common table beverage. In the Middle Ages, drinks were almost always alcoholic, even if the alcohol content was low. Even **babies** drank weak alcoholic beverages.

Mead, made of fermented honey and water, was a universal drink for those who could get the honey. It was easy to make, requiring only honey, water, and yeast. A 15th-century French recipe described its simple production: boil honey, water it down with four parts water to one part honey, and put it into a cask with brewer's or baker's yeast. **Spices** could improve the taste and were also thought to be healthful. Mead had always been popular among the Germanic tribes, and it became the national drink of Anglo-Saxon England. Mead was also made in Poland and in Russia, where it remained the drink of the poor when vodka replaced it in the habits of the wealthy. Mead was also popular in medieval Wales. Because honey was not plentiful everywhere, ale replaced mead among the common people of England and Germany. It remained in use as a medicinal drink.

Cider, *sidre* in medieval French, was a common drink. Cider is made from pressing apples for their juice, which is steeped in water and pressed again. The cider ferments in casks. William, duke of Normandy, took casks of cider along in 1066 when he invaded and conquered England. In coastal Kent, the area of England that was first held by the Normans, traditional drinkers still prefer cider. Some other fruit juices can make fermented drinks, but they were only consumed locally. Pear juice made perry, while plum juice made prunellé and black mulberries or blackberries made murrey.

Ale and Beer

Ale was the most common drink in the Germanic regions from the earliest times. It was made from yeast, barley malt, and water but did not include the preservative hops. The brewer soaked barley (or oats, for a cheaper

and worse product) for several days, until it began to sprout. This sprouted grain was called malt, and it was dried to stop it from growing real roots. Dried, ground malt went into hot water to make mash, and the liquid drained from the mash was called wort. It was very high in carbohydrates leached from the grain. (The discarded grain mash, when dried, was fed to **animals.**) The wort was then boiled with added herbs. This sterilized the wort, killing all bacteria so the brewer's yeast could thrive once it had cooled. Once brewer's yeast was added to the cooled liquid, it fermented into ale by producing carbon dioxide and alcohol from the natural sugars. If it had too much contact with air, it would spoil into vinegar. Finally, the ale was strained and could be served or put into oak **barrels** to age or to be taken to market.

Herbal additives to ale varied in different regions. One common herb, bog myrtle, probably gave the ale a very bitter, strong taste. Norwegian brewers added juniper, caraway, and yarrow. Anglo-Saxon ale herbs included rosemary, sycamore sap, and ivy. In Germany, mint, marjoram, sage, and acorns might be used. These herbs gave it a distinctive taste and may have helped to preserve it from spoiling as quickly. Wealthier brewers added purchased spices, such as cumin, ginger, and anise. Herbal additives were known as gruit, and the trade in gruit ingredients was controlled by various counts (Flanders, Westphalia, and Rhine) and bishops. This allowed their quality to be controlled, but it also amounted to a tax, since these rulers could grant rights to brewers to use these herbs.

In a large, late medieval brewery, ale went through several stages of boiling, fermenting, and straining. Large oak barrels stored the finished product. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

Brewers were aware that the water they started with had to be good or the ale would be undrinkable. They built near streams where the water was relatively clean, but they also polluted the water for those downstream. Rivers in the Middle Ages were not only a source of washing and cooking water but were also used to get rid of all **garbage.** Over the years, towns began to regulate breweries more, stipulating that they must be located in certain places.

Ale had to be brewed frequently, since its shelf life was about five days. Countless **women** made ale in small batches, enough for their family and some to sell; they were called alewives. On days when their own ale was brewing, they could buy finished ale from other alewives. Because water was often unsafe to drink, people drank ale whenever possible—as much as a gallon per day. When ale soured, most people could not afford to throw it away and replace it, so they spiced it with nutmeg to make it palatable or used it as vinegar in recipes.

Although most ale brewing was done on a small scale in private homes, there were larger ale breweries. Some private brewers supplied ale to **taverns** in towns, and **monasteries** brewed ale in large quantities. When a large monastery brewed ale or beer, it supplied its own monks, but also guests, **pilgrims,** and the poor. The brewery and bakery were usually in the same building, since the warmth of the baking ovens could help maintain the brewing temperatures. During the medieval period, bread was not yet made with yeast, but perhaps the nearby yeast brewing gave the first baker of yeast bread his ideas.

The scale of ale brewing was mostly limited by the size of the vessels a brewer could obtain. Early brewing used large **pottery** vessels for the fermenting stage, but since they needed to have a spout at the bottom to draw the finished ale out, they were not strong and could not be made very large. By the 13th century, metalworkers could make very large **copper** kettles for brewing so the mash could be boiled and fermented in the same vessel. Some late medieval ale kettles were very large, more than 1,000 liters. They were flat bottomed and sat on fireplace grates. The purchase of a copper kettle was the chief investment for a brewer.

During the course of the period, towns regulated the brewing process more and more, until it became difficult for small home brewers. Brewing was never a trade with a **guild** or a trained profession with apprenticeships. It was a home craft like spinning. But as **cities** created fees and licenses, fewer people brewed. By the close of the period, fees on brewing had killed off the craft, and some towns banned home brewing. Their concern was public safety; brewing required large fires, as did baking. Professional brewers in cities tended to produce a better product than rural home brewers, but they also charged a much higher fee.

The brewing process for beer is the same as for ale, but we reserve the word *beer* for a brewing process that uses hops for flavor and preservation. Hops is a climbing vine that grows male and female flowers; the female flowers are used as a flavoring in cooking. In Roman times, they were used as seasoning. During the time of Charlemagne, hops were grown in **gardens,** and they may have been used for flavoring ale, like any other herb. The growth and trade in hops increased during the Middle Ages, and it was often grown in monastery gardens. In the 9th century, some Frankish bishops wrote about the use of hops in brewing ale. However, its use remained local and undifferentiated from other herbs until the 12th century. When used in brewing, the hops were added to the boiling wort in a bag so they could be removed cleanly. If not, they had to be filtered out with any other vegetable matter.

Hopped beer did not spoil as readily, as the hops prevented the growth of bacteria. Hopped beer could be more widely sold and imported out of its region, unlike other ales, which had to be quickly consumed locally. Hopped beer could be made with lower alcohol content, so it could be made in greater quantity and more cheaply. However, its taste was dramatically different from traditional ale flavored with bog myrtle or rosemary. Consumers did not immediately take to it. Beer was most often made from barley, like traditional ale, but it could also be made from oats, wheat, or rye. The taste of different beers began to vary widely, since each grain made a different taste, and other herbs such as mint were still added with the hops. Each brewery guarded its recipe.

Hopped beer became a big export from northern Germany after 1200. The Hanseatic League, centered in Hamburg, began to ship both beer and hops. Since the Hanseatic League already had a marketing network for herring and codfish, it was easy for them to incorporate international beer sales. Beer from Bremen, Hamburg, and Wismar sold well in the markets of Flanders and Holland. Hopped beer was also a boon to sailors on **ships,** since it would not spoil during a voyage. As consumers adjusted to its taste, beer was in more demand than traditional ale, and brewers in Holland began to make hopped beer.

In a city of reasonable size, there might be over 100 small brewers. A large amount of the harvested grain went to beer, since water was not safe to drink. Even as the population of Northern Europe fell during the 14th century, the import of grain increased because beer became more popular.

Beer was always considered inferior to wine, but it was less expensive, and it became the most common drink outside the major wine-growing regions of France. Some considered it a healthful beverage, and some did not. The Black Death **plague** also helped beer catch on. Fewer people

meant that the price of grain fell dramatically, and brewers could afford to make more beer for the smaller population. Diet generally improved, and beer as a daily drink was among the changes.

Hopped beer came to England latest, but it never caught on to the exclusion of ale. Ale continued to be made in traditional flavors, especially at Christmas with spices and roasted apples. The transition to hopped beer came during the Renaissance, as breweries around London began using hops.

Ale and beer did not have high alcohol content in the Middle Ages. It was possible to increase the alcohol content by two methods. The ale or beer mash could be set to ferment not in water, but in ale or beer, so that its alcohol content doubled. It could also be distilled, removing water from the ale to form a more concentrated alcoholic drink. Medieval Irish monasteries began to distill ale into a harder liquor sometimes called, in Latin, *aqua vitae*—the water of life. The English first encountered it when Henry II invaded Ireland in 1170, and the Celtic word entered English as *whiskey*. Henry II taxed and licensed distilleries. Scotland also had distilleries at this time. Distilled whiskey did not become a common drink until after the Middle Ages.

Wine

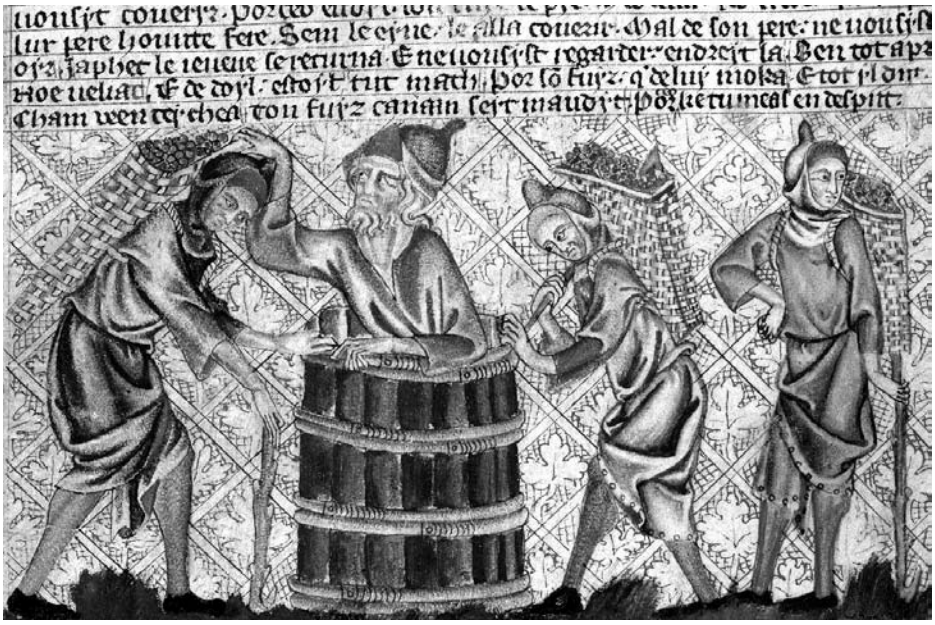
The technology of wine was well developed in Greek and Roman times throughout the Mediterranean and Middle East. During the Middle Ages, wine making spread north into Europe but decreased in the Middle East. Christian Rome needed wine for the sacrament of the Mass to represent the blood of Jesus. Jesus's use of wine at the Last Supper was part of the **Jewish** tradition, which used wine at Passover and other rituals. Everywhere that Jews and Christians colonized, they planted vineyards.

Although some **Muslims,** especially the privileged, continued to drink wine, part of the Koran forbade alcohol. Some caliphs tried to stamp out the wine industry, and although some survived, the craft faded under Islam. Jews and Christians continued to make and sell wine in Muslim regions by paying a high tax, but the most famous wines of Persia and Syria were no longer made. Muslim Spain was not as much affected by these rules and continued to cultivate the vineyards that had been there since Roman times.

Under the Roman Empire, grape vines had moved into southern France, but with the spread of the Christian religion, more vineyards were needed. Wine making expanded quickly under Charlemagne. Grapes did not grow too far north or east, but the best wine came from the outer margins where grapes could flourish. Alsace, on the border of France and Germany, became a large wine-producing region. Most of France, except for the regions

of Brittany and Normandy, was able to grow good wine grapes. Even as far north as England, some grape varieties could thrive. Monasteries cultivated grapes for their own sacramental use, but also for sale. Secular landowners also rented land to peasants with viticulture skills. In areas such as Burgundy, wine became the sole export crop, and nearly all arable land was devoted to it.

One method of creating new vines was to bend a branch down to the ground until it rooted and then either cut the new root stock (marcotte) free to plant elsewhere or allow it to grow in the same place. Provinage, the practice of leaving the rooted branches in place, resulted in a thick overgrowth of new and old vines but allowed the new vines to bear grapes in only two or three years. The best way to plant new vines was to grow roots on cuttings in a nursery and transplant the ones that thrived. The cheaper method was to plant cuttings in a furrow in a field and hope for the best. Medieval vineyards shown in pictures are not usually organized in neat rows. Pruning was done with hatchets.



The Bible story in which Noah made wine after the great flood allowed medieval artists a chance to draw another scene of daily life. The grapes arrived in wicker baskets. Trampling the grapes in a vat was the basic juice-removing method, although vats in real life were large enough for more than one person to be at work. The large vat was not set on the ground, as in the painting; it was set on a platform, so that a hole near the bottom could let the fresh juice drain into a barrel on the ground. (The British Library/StockphotoPro)

Early medieval wine was probably not good by today's standards. Vineyards could have several varieties planted in the same field, in case one variety failed that year. The grapes were not separated, and all kinds went into the wine. White wine was most commonly made because it was not fermented with its dark-colored skins and therefore ripened faster. It could be used right away and did not take up storage space. Wine was usually stored in oak barrels, but it soured fast and could not be stored long. Six months old was probably the peak of a medieval wine's quality. It was unusual for wine to keep as long as four years; most of it was gone within a year, either soured to vinegar or consumed at table. Certain varieties of grapes made fine wine, which was less sweet and made a smaller quantity, while others made large amounts of cheaper wine. Most wine consumed by average drinkers had no more than 5 percent alcohol and a fair amount of sediment.

Wine was still usually trampled by foot in large vats. In the Mediterranean region, these wine vats were usually made of **stone,** but in Northern Europe, they were wooden, like large squat barrels. A hole in the bottom allowed the juice to run off. A rule of Charlemagne prohibited the use of foot trampling on hygienic grounds, but there were few other ways to handle the task. Large monasteries or other large wine-making operations bought winepresses that screwed a tight-fitting lid onto the grapes in a vat, pressing the grapes into the bottom. A larger quantity of juice came out this way, but its flavor was not as good. The grapes could be pressed three times; the first pressing made the best wine, while the third had water added to the crushed grapes and made cheap, poor wine.

In the early Middle Ages, there was limited knowledge of what kinds of grapes to plant where. Certain varieties did not grow at some elevations or climates, but beyond this, all varieties could be mixed together. Cistercian monasteries became pioneers for the scientific study of varieties, soil, and climate. A large number of Cistercian monasteries in central France were making use of wasteland they had to clear on the edge of more valuable farmland. In one of these areas, the Côte d'Or, hilly rock faces created shelves of land at different elevations along the bank of the Saône River. The lay brothers who worked the Cistercian farms took notes on the types of soil and grapes and began to build walls to separate fields with certain varieties so the wine could be controlled. An enclosed field was called a *clos,* and French monastic wineries had names like Clos de Bèze or Clos St. Jean. The wine produced in these enclosed fields tasted the same, year after year.

The distinctive wines of today have their origins in the late medieval period, when regions began to specialize. Most famous French wines developed from the medieval monastic vineyards, such as the Cistercian winery at Chablis. The wines of Burgundy were made from very dark grapes,

and the quality was strictly controlled. Burgundy wine was most commonly known as Beaune at the time, and it was the preferred wine of the Popes at Avignon. The Cistercian Abbey at Eberbach, in Germany, was the largest winegrower of its time. The monks found that white grapes grew best there, so they produced a white wine that became the Riesling of today. The region of Bordeaux, under English control, traded large amounts of wine to England. The growers developed a light-colored wine that fermented in the vat with its skins for one day and then was poured off to finish. It came to be called claret because of its transparency and light color.

Mediterranean wines were sweeter because the grapes had a longer growing season. The wine was often made from raisins; not only were the grapes left on the vine as long as possible, they were then dried in the sun for a few days. The wine, known in England as malmsey, was both sweeter and much higher in alcohol than northern wines. Traders from Venice brought the wine to northern markets. Their galleys—with many rows of oars, like the old Roman ships—could travel swiftly and bring wine to markets before it spoiled.

At the close of the Middle Ages, perhaps in Germany, winemakers first learned how to burn sulfur inside a wine barrel before filling it. This sterilized the barrel and kept the wine from souring as fast. German wines were sweeter and soured more quickly.

At the table, the most popular way to serve red wine was spiced, with dessert. Spiced wine was called hippocras, named for the "Hippocrene's sleeve" straining cloth that removed sediment and whole spices before serving. Spiced wine was usually sweetened with extra honey (or even **sugar,** in a royal household), and then cinnamon, ginger, cardamom, mace, grains of paradise, nutmeg, and other spices were added. Each cook had his hippocras recipe, and spices were often ground and mixed in bulk and kept ready for use in wine. Spicers also sold hippocras spice blends.

See also: Barrels and Buckets, Spices and Sugar, Taverns and Inns, Water, Women.

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Boats. *See* Ships

Books

In Roman times, writing books was an important part of the culture. Greek and Roman scholars, poets, dramatists, and storytellers wrote their books on rolls of papyrus paper. After the barbarian conquest of the Western Roman Empire in A.D. 476, most of these Greek and Roman writings were destroyed or lost. Most of the books that survived were in monastery and church libraries. During the Middle Ages, books progressed from single copies, laboriously written with quill **pens** on **parchment,** to bound volumes mass-produced on a printing press.

The development that enabled this revolution was the codex, which replaced scrolls. A codex was a book made of bound pages. The idea came from a small Roman tool called a diptych, which functioned as a sort of scratch pad. It was a folding tablet made of two thin boards hinged together with string or leather strips. The outer surfaces were leather covered, but the inner surfaces were coated with wax that could be written on and then smoothed and reused. By the end of the Roman era, people had begun binding pieces of papyrus between the wooden covers. This new form of book gradually replaced scrolls and was especially favored by Christian writers and copyists. By medieval times, a book was always a codex.

Medieval Titles

By far, most medieval books were of a religious nature, especially lives of the **saints,** books about the apocalypse, and psalters, but religion was not the only reading material. Secular stories, scholars' works, and practical nonfiction were also popular. By the 15th century, when printing made mass production possible, there were many manuscripts that gave practical advice for **medicine,** gardening, and craft skills.

The book of hours, a devotional booklet, suggested prayers and Bible readings for the hours of the day. It included a **calendar** to keep track of special liturgical **holidays.** Many were custom-made for the owner, perhaps with his or her picture included in the illustrations. Books of hours are known for their beautiful, detailed **paintings** of daily life.

Some books told about the wider world most people would never see. Bestiaries were picture books about **animals,** both real and mythical. Travel

stories were popular, and since bestiaries claimed that unicorns truly lived in India, many readers had no way of telling truth from fiction. "The Travels of Sir John Mandeville" told about an English **knight**'s travels to the East and all the fantastical people and animals he saw: elephants, headless men, cannibals, and one-eyed **monsters.** In the 14th century, Marco Polo's stories about life and travel in China were published in Italy. His travels were true, but he also reported fantastic hearsay to entertain his readers.

There were many short works of fiction. In England, some stories were popular in the form of cheaply copied short books or ballads. The legends of **Robin Hood** were already popular in the late Middle Ages. Another story, "Bevis of Hampton," may have been the all-time favorite of medieval England. It told of a child hero who overcame injustice, crime, violence, slavery, love, war, monsters, and foreign travel. The story of the "Knight of the Swan" brings in a sorceress, a hermit, **babies** who turn into swans, and a mother imprisoned for giving birth to puppies.

Late medieval England also had a number of didactic works for children, including instructions about manners. *The Book of the Knight of the Tower* was a collection of stories a father felt his daughters could be reading, and it was among the early publications of Caxton, the first English printer. People also read *Aesop's Fables* in Latin and *Stans Puer ad Mensam,* a Latin poem about manners.

Practical books flourished in the 14th and 15th centuries. Christine de Pisan, a young widow, wrote practical advice for **women** and became a best-selling author in Italy. A medical book by the legendary Dame Trotula, a doctor at Salerno, circulated widely among the common people. Emperor Frederick II wrote a treatise on veterinary care for falcons, and many other medical books were copied and recopied. The 14th century saw treatises on the **astrolabe,** Arabic **numbers,** chess, farming and estate management, **hunting,** war, and knighthood.

As paper became more available, some wealthy families compiled collections of stories, copied neatly by hand. These included religious matter such as the Ten Commandments and prayers and practical compositions such as medical advice (with pictures of herbs and surgeries) or how to calculate calendar dates. Books remained scarce all through the Middle Ages, and if someone was able to spend some time with a book, at **school** or in a **monastery,** he wanted to copy parts if he was allowed.

A few medieval books became lasting classics and influenced later works. *Beowulf* is one of the most famous medieval works, read in many modern English classes, but it was unknown in its time. Only one parchment manuscript survived, and it was damaged by water and fire. The story tells about three heroic exploits of a king in southern Sweden as he kills two monsters in Denmark and, at the end of his life, slays a dragon in his

homeland. The manuscript was written around 1025, in Old English rather than Latin, and it must be read in translation.

Dante Alighieri was born in Florence in 1265 and became the Middle Ages' premier poet. He was involved in the bitter political struggles between Florence's Guelph and Ghibelline factions and found himself exiled to Rome. In Rome, he wrote the long poem he is known for—the *Divine Comedy.* As narrator, he explored purgatory, hell, and heaven. He placed many of his political enemies and others who had lived not long ago, such as treacherous Popes, in hell.

Giovanni Boccaccio was probably an eyewitness to the Black Death in Florence; he used it as the frame story for his best-known work, the *Decameron*. Ten wealthy young people escape the **plague**-ridden city to their country houses, where they spend 10 days telling 10 stories per day. The stories are short, worldly, and sometimes funny; there are no saints' lives. Both the *Decameron* and Boccaccio's other works provided models that Chaucer and Shakespeare developed in English.

Geoffrey Chaucer's collection of stories, *The Canterbury Tales,* was composed in late 14th-century English and can be read in its original words, with difficulty, by modern readers. Chaucer, a court official who read widely and wrote a treatise on the astrolabe, had probably read some of Boccaccio's works as well as other contemporary legends and stories. In his frame story, a group of **pilgrims** sets out from London to Canterbury, and they each tell a story on the way. The stories encompass the breadth of medieval literature: courtly love, **tournaments,** saints' lives, folk stories, and comic stories about improbable sexual encounters.

Manuscript Books

In the early Middle Ages, most books were hand copied by men who sought a quiet and orderly life working within a monastery scriptorium ("writing room"). Monasteries were active in producing books, partly because reading was a required activity in many monasteries and there was a shortage of books. Most early books that were copied in monasteries were of a religious nature—the Bible itself, commentaries on the Bible, church regulations, songbooks, and other writings by Christian scholars. Many of these books were made of materials produced on the grounds of the monastery. Parchment was made from the hides of their own livestock, and quill pens were made from the strong wing feathers of their own geese.

The first step in copying a book was the preparation of the parchment the scribe would use. Parchment pages could be of different sizes, depending on whether the book needed to be large enough for including illustrations or small enough for carrying. The tiniest was the girdle book, a small book wrapped in leather strips that could be knotted and tucked

around a traveler's belt so he could read while he walked. Book pages were customarily cut to be taller than they were wide because that yielded the most pages from a sheet of parchment.

The scriptoriums where the scribes worked were on the north sides of monasteries, with desks or writing boards set so each monk sat by a window. This arrangement provided full daylight without glare or shadow. In cool weather, there would be a basin of hot coals nearby, both to keep the scribe warm and to help the **ink** dry. Candles were not allowed for fear the manuscripts might catch fire.

The scribe's **tools** were close at hand—his quill pen and inkstand, a knife to trim the parchment as necessary and to sharpen the quill pen, a pumice stone to smooth any rough places on the writing surface, a ruler for measuring columns and margins, and an awl to press little holes into the parchment as markers for columns, margins, and the lines he would write on. A strip of deerskin held the parchment in place on the desk, and the sharp awl could be stuck through the parchment into the writing desk so the parchment would not slide around. Alternatively, the scribe could use the knife to hold the parchment still; there are ancient pictures of a scribe holding his knife in his left hand to hold the parchment firmly to the desk and holding his pen in his right hand while he wrote.

The scribe received the prepared parchment in sections of eight pages—two sheets of parchment, folded in the middle to form pages and set together book-fashion to make the eight pages. This eight-page section was called a quaternion, with the parchment arranged so that facing pages would be from the same side of the parchment (the hide side or the flesh side) and therefore of the same texture.

In monasteries, the scribe worked about six hours a day under a rule of absolute silence. If he needed something, he would use hand signals to tell the supervising monk (the armarias) what he needed. Making a perfect copy of a text was difficult. Concentration was essential for accuracy, as was keeping his eye on exactly where he was working. If he made a mistake, he put a series of very fine dots under the mistake rather than cross it out with a big black mark. Copying was hard work. It was physically demanding, requiring the scribe to sit still for a long time and constantly use just the fingers of one hand. Some scribes wrote a note, called a colophon, at the end of a manuscript, saying something like, "I have made an end at last, And my weary hand can rest." More often, a scribe noted simply, "Finished, thank God." A year's work might be two complete books.

After the pages were finished, they went to a proofreader, who compared them to the original to be sure they were accurately copied. They then went to a rubricator (from the Latin word *rubrica,* "red earth"), who added the title, chapter headings, and first letters of paragraphs or sentences in red or other bright colors to make them stand out. Such aids

In a scriptorium, a monk's main tools were his pen, a knife to sharpen the pen, a ruler to rest his hand on, a pot of ink, and a rough stone to rub mistakes off the parchment. (The British Library/StockphotoPro)

were needed because early manuscripts did not have spaces between lines of writing, before paragraphs, or even between words. An artist added illuminations in paint to many of the pages.

As the scribe worked through the book, the pages were numbered. The finished product, from the scribe's hand, was groups of pages nested to-

gether like little booklets and known as signatures, and then all sewed together to make what is known as a bookblock—a whole book minus the cover. To protect the book and keep the pages from being damaged at the edges, the bookblock was placed between two wooden boards that reached farther than the page edges. Typically, vellum or parchment would then be wrapped around the book to make the wooden covers look nicer and protect the stitching that held the pages together. Sometimes, as a substitute for a wooden cover, a cardboard cover was made from scraps of parchment pasted together. To protect the outer edges of the book and keep the parchment from curling, the front and back covers were hooked together with a clasp to keep the book tightly closed when it was not in use. Some books were then fitted with a chain so they could be fastened to the lectern, protected from theft or carelessness. Beginning sometime in the 12th century, leather book covers began to be embossed with designs or pictures stamped into the leather. In the 15th century, some books also were decorated with gold tooling—the addition of **gold** flakes hand pressed into place—and precious gems. A book so decorated was not kept in a row of books on a shelf; it had an embroidered silken case.

The practices of rubrication and illumination grew until many manuscripts were works of art. They used a wide variety of paints and inks and often included gold flakes or gold leaf. The names of these early monastic rubricators and illuminators are not known, as they did not sign their work. These anonymous illuminated manuscripts are among the most famous products of the Middle Ages. The early medieval *Book of Kells* may be the best known, but there are few books about medieval Europe that do not draw images from other, lesser-known illuminated manuscripts. Choir books of **music** notation, gospels, calendars, psalters, epic legends, and saints' lives were the most common kinds of illuminated manuscripts.

One of the richest sources for information about English life in the early 14th century is the Luttrell Psalter. The Luttrell family, minor nobility, commissioned a book of Psalms, probably for their parish church and perhaps for use while praying for their souls after death. The Latin Psalms appear on each page in regular Gothic script, but every page carries a wide variety of painted pictures that seem unrelated to the psalms' content. Most pictures occur at the bottom of the pages and are called *bas-de-page,* but others appear in the middle of large capital letters, in the margins, or even at the end of a line of words. There are pictures of peasants working on the farm, musicians playing a variety of instruments, the high table at a **feast,** a grand coach carrying queens, deceased souls petitioning for mercy, scenes of war, **beggars,** people playing **games,** and both a windmill and a watermill.

Saints' deaths and Biblical scenes abound in the Luttrell Psalter, but the noble character of a psalter did not constrain the artist's imagination. Leaves, vines, trees, and flowers frame most pages. The margins are filled

with grotesques who may represent demons but who may also just be fanciful products of the imagination: dragons; creatures who are half human and half fish, bird, or beast; and creatures with two heads, bird's legs, or wheels. Such images are also called drolleries and appear on manuscripts from the *Book of Kells* to the late medieval books of hours.

Illuminated manuscripts developed the artistic potential of the letters of the **alphabet.** Calligraphy—beautiful writing—was a new idea. Although the text was usually carried forward in a standardized style, special letters became playgrounds for the artist scribe. Artists developed a certain decorative style for capital letters and carried it out, with variations and an array of colors, on every page. The first capital letter on a page, or beginning a section, often got even more imaginative treatment. Some letters were made out of human figures standing, lying down, or joining hands to form the shape. Other letters display imaginative shapes and flourishes, and many act as frames to very finely painted scenes.

Around 1150, professional scribes and illuminators began to take over the book business. Not all scriptoria were in monasteries, and not all scribes trained in the monastery remained there for their work. Schoolmasters, wealthy lords, and scholars owned writing chambers in towns, especially in **cathedral** or **university** towns. They would commission scribes to produce various kinds of written materials or would do the work themselves. These books were more functional than the illuminated manuscripts. Readability was the chief concern, and conventions for word spaces, sentence spaces, and paragraphs began to develop.

Because of the cost of parchment, a draft or "scratch copy" of the work was given to a clerk on a wax tablet or a slate, rather than using parchment for the first draft. Or the author might read his work to the clerk, who would write it onto wax and then transcribe it onto parchment. Many stories or songs that had been only in the oral tradition were put into writing in this way. Clerks also served as secretaries, writing letters for their employers. There was even a bit of a black market in illicit book copies made without permission. Today's scholars have found letters written by medieval folks who complained that their friend borrowed a book and did not send it back until he had surreptitiously copied it.

With the rapid founding and growth of cathedral schools and universities, beginning around 1100, commercial book production surged. Most schoolbooks were plain columns of text on pages bound between wooden boards. Colophons in manuscripts of that era identify some 23,774 names of scribes and illuminators, most of whom were trained in universities or monasteries.

See also: Alphabet, Animals, Calendar, Libraries, Monasteries, Parchment and Paper, Pens and Ink, Printing, Schools, Universities.

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Brass. *See* Lead and Copper

Bricks and Tiles

Bricks and tiles were both strong building traditions in the Roman Empire and remained strong industries in Italy. Northern Europe, especially along the coast of the North Atlantic and Baltic Seas, had good clay deposits. During the 12th century, **cities** in these areas began using brick for building; the craft may have been spread by Cistercian abbeys that used brick. Because brick and tile were not flammable, they became attractive building materials as medieval cities wearied of massive fires. Unlike **stone,** bricks and tiles were small and light and could be moved about in **carts.** The use of bricks and tiles spread all through Europe.

The Teutonic Knights, a late **Crusading** order based in Germany, built many **castles** of brick. By the late Middle Ages, attacks using fire had become standard ways to burn down or collapse a castle. Brick walls were immune to the effects of fire, since bricks had already been baked in kilns at very high temperatures.

Medieval bricks could be thicker or thinner than modern standard bricks, and different clays varied their color. This Cistercian abbey in Germany added decorative bricks. (Andreas Bauer)

Bricks and Roof Tiles

Brick making is one of the few crafts that were not depicted in any sort of medieval art until the 15th century. A Bible from 1425 showed a brickyard with a two-story kiln in the background, a work shed, and handcarts filled with bricks being moved into stacked lattices of rectangles. The picture shows the basic steps of making bricks, which do not vary across place or time, but it also suggests some of the methods at use in that particular place, which may not have been uniform.

All bricks and tiles begin with the right kind of clay, dug out and cleaned of rocks. Some clay must have sand or water worked in to reach the right consistency. Brick makers use molds to shape each brick, either one by one or in sets. In the Middle Ages, they worked at benches in sheds. Bricks have to dry for at least two weeks, and some medieval European brickworks kept bricks in rotations such that they could dry for a year or more. Once they have cured slowly this way, they can be fired in a kiln. Kilns could be like bread ovens, such as the two-story kiln in the drawing. Here, a bottom fire compartment heated the upper drying chamber. Kilns could also be temporary; the bricks were built into stacks, covered with a temporary roof, and filled with wood between the rows. When the bricks were fired in a clamp like this, the whole thing was dismantled to remove the bricks.

Cistercian abbeys used bricks extensively, and as these **monasteries** spread into Northern Europe, brick use did too. Bricks were a major building material in the Hanseatic towns like Lübeck and in the Netherlands, then called Flanders. There are still fine medieval town gates, **guild** halls, **cathedrals,** and even castles made of brick in these regions. As brick use moved into England, bricks were adapted to the timber-framed construction method. Brick and mortar could fill in the gaps between the square-cut timbers that framed the walls.

Brick could be used in decorative techniques. Some bricks could be painted white with lime after the building was completed. Bricklayers learned to create patterns in the walls by turning bricks around to stand out from the flat surface, and they planned patterns by using the natural color variations of bricks. Bricks easily made Romanesque and Gothic arches; brick walls could have both galleries and blind galleries.

Bricks became especially useful in building chimneys. During the late Middle Ages, city roofs shifted from thatch and smoke holes to slate or tile roofs with chimneys at the side. Although the first chimneys in castles were made of stone, brick was far more convenient for any building that was not a fortress.

Greece and Italy had produced roof tiles since classical times. Other European regions also began to make roof tiles. Flemish roof tiles were curved and interlocked, like Mediterranean tiles. A row of concave tiles required a narrow row of convex tiles to cover the join. English tiles were flat, simpler to make than the curved Mediterranean tiles. They hung on pegs along the rafters. Although the rafters could still catch on fire, roof tiles were very resistant to sparks.

Decorative Wall and Floor Tiles

The Islamic world began using wall tiles in building, either decorated or as mosaics made from broken pieces of different colors. **Muslim** builders used tiles as both indoor and outdoor wall coverings. The use of wall and floor tiles spread into Northern Europe primarily through Cistercian abbeys. Eventually, tiles were used to surface heating ovens in the colder parts of Northern Europe; their widespread use in Germany pressed potters to develop the craft more than it was developed in England or France.

Tile techniques followed the general development of ceramics. Like **pottery** jars, tiles began unglazed or glazed with simple brown, yellow, or green lead-based glazes. As the tin-glazing technique spread, tiles could be white, and with the growing availability of cobalt, they could be white and blue. The full development of tin and cobalt tiles in Northern Europe came after the close of the Middle Ages with the development of the Delftware trade. In Spanish Andalusia, though, it was fully developed in the tile art most famous in the Alhambra palace.

In early medieval Europe, tiles were most likely to show up on church floors. Even without tin glazing or colors, there were ways to make them decorative. Unglazed tiles could be molded into shapes that could interlock to form a mosaic. Some church floors have elaborate mosaics of circles, flowers, diamonds, triangles, and hexagons or even more complex fleur-de-lis shapes. The natural variation in clay color was incorporated to make beautiful patterns.

There was a simple way to create design with two colors. The potter or tiler pressed reddish clay into a wooden mold with a carved design. When the clay dried to the leather stage, lighter-colored clay filled in the imprinted design to create a contrasting color, and then the tile was glazed and fired. This technique is called encaustic. Tiles could display checkerboards, religious symbols, heraldic designs, flowers, or trees. Later inlaid two-color tiles had carefully drawn pictures of kings and characters from the Bible.

During the 14th century, tile makers started printing designs onto tiles. One technique used slip, a suspension of clay particles in water. The tile makers made a die for the design, dipped it into the white clay slip, and printed it over and over on tiles. This method was cheaper and faster than stamping and inlaying. Late medieval tiles were also stamped with relief designs carved into molds. They could be fired unglazed or glazed yellow, green, or brown.

See also: Houses, Pottery.

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Bridges

During most of the Middle Ages, rivers and streams did not have bridges at all. Shallow places were fords where people, **animals,** and **wagons** crossed up to three feet of water. Deep places had ferry **boats,** often with a rope across the stream so the ferry, attached to the rope, could go back and forth easily. Ferries were wide, shallow, square-browed boats with a good

landing place on each side. Passengers would pay a toll to support the ferry service.

The simplest bridges were designed for foot travel and packhorses over small streams. Footbridges of wood were most common, but none have survived into modern times. Simple **stone** bridges came in two kinds, flat and arched. Flat bridges used stone piers and a wooden **road** surface that did not make use of arches. The timbers went from shore to pier to shore; alternatively, the road surface could be slabs of stone. Arched bridges, entirely of stone, were the best, and the development of bigger and improved arched stone bridges occupied the period's engineers. Causeways were alternatives to bridges, especially when the body of water was broad or marshy. One medieval causeway in England, across the fen near Chippingham (one of Anglo-Saxon King Alfred's homes), was over four miles long.

Early medieval bridges were made of wood. London had two large wooden bridges before the first stone one was built. These bridges were not wide by modern standards, but they were wide enough for carts to cross, unlike those for foot travel and packhorses. None have survived, nor do we have pictures of them. They must have used bundles of timber pilings, braced like timber-framed roofs, to support the roadway. Timber bridges could be made strong enough to carry traffic, but they were vulnerable to flooding. In some parts of Europe, such as northern England and Germany, ice flows in the spring put great pressure on bridge piers and could take them down.

Bridges were defensive structures in several ways. If a **city** controlled its bridge, it could keep an enemy from crossing. It could also use the bridge to fence off the river so that if the enemy arrived in ships, their progress was halted. Wooden bridges were easy to destroy in defense of a city. Defenders could burn or pull down a bridge to turn its river into a moat. If the bridge still stood, attackers could seize it and use their advantage to isolate the city.

Medieval engineers needed to develop bridges that were wider and stronger as their cities grew. They began with the technology the Romans had developed; some Latin texts were still available. The bridges themselves still stood, especially in the Roman heartland, but some Roman bridges remained in outlying places like England. Roman engineers had developed several key techniques for bridges: waterproof cement, cofferdams, and arches.

Cofferdams are temporary walls enclosing a portion of riverbed that could be drained and used as a construction site. Using cofferdams, Roman engineers could build large stone footings for bridge piers and dig down to solid rock where possible. Medieval engineers also used cofferdams. They drove **iron**-tipped logs into the riverbed like nails, close together,

until there was a firm foundation in the soft riverbed. They built stone piers as footings and often enclosed the area within the cofferdam, around the pillar, and filled it with rubble. This island footprint for a pier was called a starling in English. Once the work was done, the cofferdam could be removed. With waterproof cement, the masonry would be sturdy whether the stream flowed directly around it or in times of flooding.

Arches transfer the load borne by the top of the arch (roadway) to the foot of the arch (pier supporting bridge). The more circular the arch, the more directly downward the weight is transferred. A shallower arch transfers the weight outward, horizontally toward the pier, as well as downward. A true semicircle arch is the most stable, but it is also smaller in span and requires more piers to cross a river. Wider, shallower arches allow for fewer piers but are weaker and require both stronger piers and more engineering skill for calculating their strength. When a bridge has more piers, the river's space is more restricted, and in flood seasons the water will run higher and threaten the bridge. Roman engineers learned to make piers somewhat pointed facing upstream so the floodwaters would part around each pier and not press on it as much.

In the 12th century, medieval bridge builders picked up the Roman tradition and experimented with shallower or elliptical arches. They made their piers pointed facing upstream, and often the starling around the pier also was pointed. At the road level, the pointed area could be used in various ways. Left open, but enclosed with a wall that led out to the point and back, it became a place where foot travelers could stand when a wagon took up the roadway. On a larger bridge, the pointed upstream area of the pier was large enough to build a small chapel or defensive tower. Many bridges had chapels for travelers to rest in or hear Mass before starting on their way.

Bridges were expensive, long-running public works. Frequently, they were built by private parties, such as the local lord or **monastery.** The builders usually collected tolls for the upkeep. Because bridges were so necessary, and so expensive, bishops often declared an indulgence for those who would help. A dying man or woman who left money or farm animals for the upkeep or building of a bridge would have less time in purgatory after death. Those who were under long penances for sins could have them shortened if they manually helped build or gave money to build or repair a bridge.

In 1176, two notable bridge events kicked off a new era of building. In London, a stone bridge over the Thames River was begun to replace an older wooden one. The new bridge took over 30 years to complete. It had 20 arches, and since it took so long, each arch had to be freestanding in itself. It was a wide bridge for its time, wide enough for two wagons to pass, and it had footpaths on either side of the road. A drawbridge stood to one

side, permitting the wooden road to lift and let boats through. The center had a chapel. During the Middle Ages, only a few houses were built on this bridge, although London Bridge later became famous for having a community built on it.

Around the same time, a company called the Bridge Building Brothers formed in southern France. These monks undertook to build bridges and maintain ferries. Their first building project was the bridge across the Rhone River at Avignon in 1176. It was one of the outstanding bridges of its time, extending to an island in the middle of the river and then to the other shore. It, too, had a chapel on one pier; the chapel was dedicated to Saint Nicholas and held the body of the bridge's original founder.

By the late Middle Ages, some long urban bridges had several stories of buildings lining the narrowed roadway. The Ponte Vecchio of Florence had a long gallery—an enclosed walkway—connecting the Uffizi Palace on one bank and the Pitti Palace on the other. Because the roadway was not wide to begin with, these buildings were cantilevered out over the water. The Ponte Vecchio bridge had butcher shops on one side located so the slops of the butchering process could drop directly into the river.

London Bridge kept as many as 60 employees busy every day. The bridge had to be continually inspected and repaired, and its growing population

Florence's Ponte Vecchio still has shops overhanging the Po River, as it did in medieval times. (Mubadda Rohana/Dreamstime.com)

of houses and shops required repair and management. The bridge employed carpenters, masons, pavers, plasterers, carters, guards, and a boatman. The bridge's foot on the south side had a large house containing the workshops of the bridge's work force. It included stables for the horses and dogs and a kitchen with a full-time cook for the employees. The bridge even owned some meadows where hay for its working horses was grown, so the bridge employed a few farmers.

See also: Cities, Roads, Wagons and Carts.

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Bronze. *See* Lead and Copper

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Calendar

Calendar, in modern usage, means a booklet of monthly schedules of numbered days, often with an illustration. In the Middle Ages, calendar meant the annual schedule of **holidays, fasts,** and **feasts** in honor of the **saints.** Some days were fixed and some were movable, calculated by the position of the moon. Medieval calendars kept track of the moon's position. While modern calendars keep track of days within a month and help us remember the commitments we have for each day, medieval calendars kept track of years and lunar cycles. The organization of a month was an afterthought.

There were **books** that laid out the calendar, many of which were organized by month and included illustrations, like modern calendars. They were known as books of hours, since their main function was to help the owner know saints' days so he could recite the correct prayers at the correct hours. Books were too expensive to make disposable ones for each year until **paper** and **printing** made it possible. Medieval calendars were intended to be permanent. These books were lavishly illustrated. Each month's page was decorated, in the style of its time, with borders, calligraphy, and pictures. The pictures usually showed ordinary activities on a typical day of that season. On these beautiful calendars, peasants sled, skate, butcher, and carry wood in the cold months. Ladies gather flowers while teams of **horses** and oxen draw plows and vintners prune vines in spring. The pictures flow around the central calendar chart.

On the calendar chart of a book of hours, there were columns on the left in red or black ink. One column gave the dominical letters: *a, b, c, d, e, f, g.* The first day of the year was *a,* the second was *b,* and so on. However, 365 days in a year did not divide evenly by 7, but left 1 over, so the next year, the first day would have to be *b.* In this way, the shift in days of the week could be tracked. It was up to the calendar's user to know how to interpret the days that year; one year, all *a* days might be Sundays, and next year they were Mondays. Two other columns gave the position of the moon and the Roman numbered date, which was also based on the position of the moon. The rest of the line told the user what day it was in the liturgical calendar, often which saint was to be honored that day.

The medieval calendar was based on the Roman tradition of the Julian calendar. The Julian calendar used 12 lunar months to track one solar year, with irregular days spread out to keep it as even as possible. Medieval calendars tended to use modified Latin spellings: Januarius, Martius, Maius, Julius, Augustus, October, and December had 31 days. April, Junius, September, and November had 30 days, while Februarius had 28. Februarius had an extra day in leap years, as in modern times.

Charlemagne tried to introduce a new calendar of months using the Franks' native language. His year began with renaming January as *Wintarmanoth,*

A medieval calendar showed the saints' days for the month, and it could be used for many years in a row. Days were not arranged in a chart, as in modern times; they came in a list, marked with letters and Roman numerals so that days could be calculated by the Roman system. The day of the week mattered less than the saint's festival. The margins around a calendar book (a book of hours) were always painted with elaborate designs and scenes of daily life. (The British Library/ StockphotoPro)

and next was *Hornung*. The months then used the significant events and farm occupations of each stage in the seasons: *Lentzinmanoth, Ostermanoth, Winnemanoth, Brachmanoth, Heuvimanoth, Aranmanoth, Witumanoth, Windumemanoth, Herbistmanoth,* and *Heilagmanoth* (Holy Month, because of Christmas). The calendar reform did not last beyond Charlemagne's time and was never widespread. The **church,** centered in Rome, used the Roman calendar, so the Franks adopted it.

Traditionally, people tracked significant dates by the liturgical calendar. A baby was born just before Martinmas; a fair was held on Saint John's Day; pilgrims would set out on Whitsun or Midsummer Day. Knowing these saints' days in order was a daily-life skill. The best-known ones were as well-known as modern Thanksgiving, but lesser saints' days could be memorized in a poem designed to put them in order in a catchy way.

The modern system of counting numbered days through each month developed during the Middle Ages for business and record keeping. Bede used simple numbers in his history of the English people. By the 14th century, notaries simply wrote down the numbered day of the month. However, in the books of hours, and officially, Europe followed the old Roman system of numbering days. It was a complicated method, but it had the virtue of tracking the phases of the moon, which helped in calculating lunar-determined feasts.

Romans divided their months into periods based on the phase of the moon. There were 3 key days. Calends (or kalends) was the 1st day of the month, the new moon. It was called *calends* because a Roman official had called out (Latin *calere*) the start of a new month and time to pay interest on debts. Ides meant the middle of the month, the time of the full moon, usually the 13th or 15th day. Nones was 9 days before the full moon. Only these 3 dates were distinguished, and all other days were named in relation to them. If the ides of a month was the 15th day, then the 14th day was the "pridie idus"—the day before the ides. Each day was named by working backward to the next key day.

The medieval calendar used the Roman system. The month's first day was Calends, and the next day, depending on the month, either IV or VI before Nones, and on with a countdown to the Pridie Nonus and Nones itself. There was then a countdown to the Ides: VIII, VII, VI, V, IV, III, Pridie Idus, and Ides. The second half of the month counted down to the Calends of the next month. Holy Innocents' Day, which we call December 28, was "ante diem IV Januariis." On the chart in a book of hours, one column tracked these countdowns.

Although there was an understanding that the first of January began a Roman new year, most medieval societies regarded a date in spring as the beginning of the new year. In England and some other European countries, the year began on the Feast of the Annunciation, March 25. In France, the year began on Easter, although the date moved. Some people considered the year to begin at Christmas. Only in the 14th century, as international banking required standardization of dates, was the first of January firmly established as the start of a year. Traditional celebrations continued to be held in spring until the 18th century.

One of the most contentious issues in the early Middle Ages was how to calculate the day of Easter. In England, the Irish tradition of Saint Patrick was not the same as the Roman tradition of the later-converted Anglo-Saxons. Some English monasteries had been founded by Irish monks and continued to calculate Easter the Irish way. In 664, there was a national conference, the Synod of Whitby, on how to decide when Easter would fall. They voted to adopt the Easter tables drawn up by Dionysius Exiguus in 525 in Rome.

Dionysius (or Dennis) tackled the difficult problem of how to name years, as well as how to calculate Easter. The Roman Empire had named years for the emperor or consul, a system that ceased to work well after the fall of the empire in the West. Dionysius, a monk who lived in Rome in the sixth century, drew up a table showing the dates of Easter in many years. He identified that he was writing it 525 years after the birth of Christ, or Anno Domini—"in the year of our lord." He used this approximation to rename the years that had been named for Emperor Diocletian, who persecuted

Christians. There was no way to check Dionysius's statement of when Jesus had been born, but it was based on church traditions and calendar systems. Although he did not recognize the need to name the year of Christ's birth the Year Zero, his tables made the first use of the concept of zero in a Latin work. Calculation of Easter was based on a cycle of 19 years, and he designated the beginning of each period as *nulla,* the Year Zero for each cycle.

The English monk Bede studied Dionysius's tables and extended them into the eighth century following the Synod of Whitby. He wrote several books on how to calculate time, and he also wrote *The Ecclesiastical History of the English People.* He dated his work 731, according to the new Anno Domini system of Dionysius. Bede's book was more influential than he might have imagined. It was copied many times and came to the continent when Charlemagne recruited the Anglo-Saxon scholar Alcuin to found his **school** and **library.** Through Bede's history and Dionysius's Easter tables, the Anno Domini dating system spread.

During the Middle Ages, scholars began to notice that the Julian calendar was not precise enough. Over the years, the new and full moons no longer matched the Calends and Ides as they were supposed to. Every year there were about 11 minutes unaccounted for. By the ninth century, astronomers were noticing the discrepancy. In the 13th century, Roger Bacon could see the problem clearly and criticized the Julian calendar. Pope Clement VI received a report suggesting that four days should be dropped in 1349, but the chaos of the **plague** of 1347–1348 buried this recommendation. In 1436, a Council at Basle received a report by Nicholas of Cusa that recommended that they drop out one week between Easter and Pentecost. The council felt it would be too confusing and that it would interfere with merchants' calculations of interest on loans. The corrected Gregorian calendar was not adopted until 1582, and it was not until 1752 that days were deleted to correct the growing inaccuracy.

Europe's two main minority cultures, the **Jews** and the **Muslims,** had their own calendars. The Jewish calendar months were already in use during the time of Moses and were based strictly on the moon's cycle. Each month began when the first sliver of moon could be seen following the dark new moon. Every 19 years, the year had an extra month to catch up with the solar year again. Christians who calculated Easter had to understand the Hebrew calendar, since Passover's calculation was based on moon phases in the month of Nisan. The years had been numbered since ancient times; traditionally, Year One was the Creation. The Muslim calendar began with a Year One when Mohammed fled from Mecca to Medina. It used 12 months alternating 29 and 30 days; like the Jewish months, each Muslim month began with the first crescent moon. The Arabic month names also referred to seasons, but its names never became familiar in Europe apart from the

month that roughly corresponds to September—*Ramadan*—when Muslims fast.

See also: Books, Holidays, Jews, Muslims, Saints.

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Candles. *See* Lights

Carts. *See* Wagons and Carts

Castles

A castle was the fortified private residence of a European lord. Fortification was not a new idea. Ancient **stone** or earth forts had been built at strategic points by the Roman army, and ancient **cities** had often been walled, but they were not family residences. Modern forts are owned by national armies as **weapons** storage and barracks, but European castles were owned by individuals. Medieval castles were truly residential homes, but they were at the same time the most highly developed military bases in the world. Personal comfort and safety balanced against each other, and, in each century and place, either safety or comfort carried more weight in a building's design.

A plain **knight** was too insignificant to own a castle. He would have only a manor house, with surrounding farmland and rented farms. This manor house might be somewhat fortified, built of stone or including a defensive tower, but it was not a castle. In order to have a castle, a knight needed an aristocratic title that gave him governmental power in the region. A castle's owner might be a baron, an earl, a count, a duke, or a king, depending on the use of title and rank in each part of Europe. The surrounding lands were controlled by vassals who owed him service. Some castles were owned by a king and were known as royal castles. Kings built castles, but they also received them as payment for debts or as default inheritances for family lines that ended with no heirs. They kept some of these castles, but they also gave some to lords who supported the land's defense.

Most castles were built during a time when the power of national governments was not great. Although the land close to a king's residence could count on his protection, regions farther away could not. Even if they owed allegiance to the king, they had to depend on local strongholds for defense. Regional lords were kings on their own lands and maintained the defense of rivers, coasts, and towns. Some of these lords were nearly as powerful as kings, and their degree of autonomy varied. The construction of an unauthorized castle might signal intent to rebel, so kings kept a careful watch on these centers of power. In most of Europe, a king could license a castle's construction or order its destruction if he retained firm legal control over the region.

Castles were placed at strategic military points for defense or as forward bases in a conquest. A castle might guard a river or mountain pass, or it might be placed in a region in order to distribute military power. Each building site was evaluated for how the land could help defend the castle. Most castles were built near running **water,** and their foundations were on solid rock where possible. Because castles were home to many knights, servants, and other staff, as well as the family, a good **food** supply was a major consideration in choosing where to build a castle that had a primarily residential purpose.

One function of a castle was to protect the peasantry and its economy, on which the castle's economy depended. If the region were under attack, the peasants were supposed to bring all their **animals** and produce into the castle. This reduced the food supply for attackers, supplied the castle with more food, and acted as payment for community protection. In times of peace, peasants were often required to work on castle maintenance. They dug ditches, cut wood, or did simple repairs. In some regions, they paid a traditional tax of one-twentieth of their produce in return for the passive protection of the region's castle.

Castles were also administrative centers, where rents were paid and trials held. Although castles are often known for their **prisons,** their use for imprisonment came later, when their military purpose was no longer important. While a man might be held briefly for trial in a castle, his punishment was either a fine or a physical punishment such as flogging or death. Castle design rarely included rooms built specially for imprisonment.

When the lord of a castle was in residence, banners flew from the turrets, and shields might be displayed along the walls. No lord of a castle lived there all the time. If he did not own other castles or manors, at the very least he owed his overlord, the king, the duty of living at his court for a time. Castles needed to be cleaned and the food restocked when a lord was away, so most castles were half-empty much of the time.

Government was a personal affair in the Middle Ages, so the lord's residence at his castle was just as important as his technical ownership of the land. In each century, the definition of good family living changed, but in

all times, the castle's living style was the epitome of what the age considered good. In early times that prized communal living and public status, the lord's family ate in the hall on a raised platform. When a later age valued luxury and privacy, the lord's family apartments in the castle were modified to give them the best luxury and privacy available. The castle family's style of living impressed the peasants and townsmen and increased the respect they were owed. **Feasts, tournaments, weddings,** and other public displays were an important part of castle life.

Castle Development

Early French castles, including those built by Norman French invaders in England, were made of a motte and a bailey. The castle was built on an artificial hill, the motte. The builders dug a ditch and piled the dirt in the center to form this mound. It was built carefully to be strong and included layers of clay, stone, or timber. The castle itself was no more than a wooden fort with a strong palisade of logs around it. The inner building was a wooden or stone blockhouse or tower. The earliest term for this tower is *donjon,* a Norman word derived from the Latin *dominus,* or "lord." Later English writers referred to the inner tower as a keep. The word *donjon* remained in common use when post-medieval castles were used as prisons, and it became the word *dungeon.*

The bailey was the palisade wall around a larger cleared space at the foot of the mound. The open space was called the ward. Some castles had two baileys, inner and outer, for extra defense. Ditches might be filled with water or lined with spikes. Bridges or causeways connected the motte with the bailey.

The entrance to a keep's living quarters was on the second story so it could be defended by removing the stair. The first floor was a storehouse. Large towers, even if built of timber, could be complex. The motte tower at Ardres Castle, built in France around 1117, was three stories high. The topmost story had small rooms for the lord's children, for servants, and for watchmen. The second story was the main living floor and incorporated the great hall as well as private rooms for the lord's family, for the more important servants, and for tending the sick. The castle had a two-level kitchen, with the upper part on this main second story. The ground floor was the storehouse for all kinds of food—sacks of grain and casks of wine as well as live animals. Stairs and corridors connected the three floors to create a community under one roof.

These early castles were watchtowers as well as defensive structures. When the duke of Normandy successfully invaded England in 1066, he immediately ordered a string of motte-and-bailey castles to control the countryside. Some were built on hills, and even the modest elevation of a man-made

motte provided greater sight across the land. By keeping close watch from an armed garrison, they were better able to put down rebellions.

The next development was to use more stone in building the donjon, or keep. Stone keeps of the 11th and 12th centuries could be shell keeps or tower keeps. A shell keep was round; its stone walls may have literally replaced the wooden palisade. An outer ring of stone rose from the edges of the mound, and rooms were built on the inside, against the walls, with a courtyard in the middle. A tower keep was square or rectangular, and it became the dominant style until the **Crusades** changed the fashion again.

Some tower keeps were built on existing mottes, but many were built on flat ground inside enclosures. The tower keep was a large, rectangular building, two or three stories high. The first story did not have windows so it could be defended. The second story usually included a large hall and a chapel, along with well-decorated rooms for the lord's family. These rooms had windows, but they were narrow windows with heavy shutters. The keep's building enclosed its well, and some large keeps had a shaft to the well that went up to the top stories. **Latrine** chutes were built into the outer walls. At the top of the keep, there were usually defensive structures such as crenellations or towers, but otherwise the rectangular tower keep was just a large blockhouse. The English castles at Norwich, Rising, Rochester, and Dover are the best-preserved examples of 12th-century rectangular tower keeps.

Castle technology improved rapidly when the First Crusade established a Crusader kingdom in Palestine. The mixing of cultures, where Normans mingled with Greeks and Turks, created new building techniques. They copied some features of Middle Eastern fortified towns. Crusader-style castles were built entirely of stone and were designed as complex fighting structures with an innovative concentric layout. These innovations in the Middle East traveled home to Europe and helped the castle evolve into a complex fighting machine.

The best fortified of these 11th- and 12th-century castles included concentric rings of defensive walls, multiple sets of gates (sometimes with surprise features like right-angled entrance passages), and towers designed to provide cover for each other and for the gates. Each concentric ring of wall had its own gate and battlements. Between these walls were other defensive traps, such as cliffs, ditches, and moats.

Stone castles were constructed at ground level, not on an artificial mound. The outer bailey wall was made of stone, with cut stones covering a core of rubble stone. It was designed as a fighting structure, rather than just a wall. The top of the wall had not just a parapet (a ledge wide enough to walk on), but also crenellated battlements with solid merlons alternating with open spaces—called crenels. The crenels were sometimes hung with hinged wooden shutters to protect defenders as they reloaded their weapons. The

Rochester Castle is a perfect exemplar of the 12th-century style in which the castle was built around a square keep. Castle life centered on a second-floor great hall and universal well shafts that ran from top to bottom. Although daily life was as full there as anywhere, nobody could ever forget that they were living in a true fortress where comfort and convenience were sacrificed to defense. (Light & Magic Photography/ Dreamstime.com)

outer walls had large towers and smaller turrets to allow the defenders to rain down arrows, stones, or quicklime on attackers. The outer gate was thick and included many defensive features.

While the earliest stone castles had used rectangular tower keeps, newer castles used rounded towers and keeps. Corners had proven too difficult to defend against miners who dug under them and caused buildings to collapse. Even simple 12th-century castles consisting of only a keep and a bailey used forms of rounded construction. The lower section of every wall was constructed thicker and angled outward to make it less vulnerable to battering rams. This thicker section was called the plinth.

Castles in transition from the older form to the Crusades-influenced plan were designed with not only a keep but also a hall and chapel separate from the keep. Although the keep was now round, the hall was rectangular. If it did not need to be the last place of defense, it could be planned as a better place to live. The new halls were larger, and they had kitchens and other outbuildings attached. There was often a separate chapel, and the buildings usually formed a square around a courtyard. By the 13th century, the cluster of buildings was designed as a unified, defensible castle, and the solitary

keep gave way to multiple strong towers. They were planned with inner, middle, and outer wards and baileys. Newly built castles were sited on hills, cliffs, islands, and other inaccessible places.

Another innovation came in the form of improved ways for the castle's defenders to fire back at attackers. The earliest of these defensive holes were simple arrow slits, adapted from ventilation holes, and wooden hoardings. The hoard was a timber structure built out over the edge of a defensive wall so defenders could walk on an elevated and covered walkway, looking down on attackers. Holes in the floor of the hoarding allowed them to drop things on the attackers. Both of these defensive structures became more complicated over time. Arrow slits were made in a cross shape, not a simple vertical slit, and the stone was angled so the slit was much wider on the inside where the archer stood to aim. Hoarding was replaced by machicolations, stone structures on the outer side of a wall. Machicolation also allowed defenders to look through holes straight down on the attackers and drop or fire defensively on their heads and faces.

Gates were a point of weakness in a fortress, so they were heavily guarded. In a castle with concentric rings of walls, each wall had a separate gate. The back gate, called the postern, was often built in a less accessible place, and the front gate was the hardest to attack. A gate's foremost towers, the barbicans, were heavily fortified. If the wall had a moat in front of it, the first defense of the gate was its drawbridge. The outer end normally extended over the moat, and the inner end was weighted and positioned over a pit so the weight could drop into the pit and easily raise the outer end. The entrance was guarded next by a portcullis, an **iron** gate that was raised and lowered by ropes, pulleys, and weights. It was mounted in a gatehouse with thick walls, and over the portcullis were "murder holes" to drop stones through. The gatehouse was sometimes surrounded by flanking towers that jutted out from the wall, permitting defenders to shoot at anyone attacking the barbicans.

The later Middle Ages were a time of stronger central governments. Barbarian invasions were over, and in Spain, England, and France, kings had conquered or absorbed formerly independent kingdoms and counties. Castles in the 14th and 15th centuries were built for comfort and style, although always bearing in mind the need for defense. While our modern hindsight can see that the time of castles was ending, the castle builders did not know this.

These newer castles had moats, walls, towers with crenellated parapets, gatehouses, and even arrow slits. However, they also included **glass** windows, and architects began to pass over the more intense defensive structures, such as ditches, spikes, and murder holes in the gatehouses. Walls were thinner. The new castles were more comfortable inside, with more private rooms, better sanitation, and better heating. Some were built of **brick** in-

stead of large stone blocks. The castle was becoming a mark of style, rather than a defensive necessity.

Inside a Castle

The castle ward was an open place for work, and it often had several **gardens.** There was always a well dug to the **water** table somewhere in the castle ward, and usually at least one well was inside the keep. Most castles also had cisterns to collect rainwater. Stables and work sheds lined the walls.

The floor plan was simple in early castles. The main room—the hall—was used for feasts and the daily business of the castle. Nearby was a chapel. Not far from the hall, some garderobes (latrines) had been built into the outer walls; they were often reached by a small passage that turned once or twice for privacy. As castles evolved from simple keeps to larger structures, improvements included servants' passages between the separate kitchen and the hall, stairs going to the private rooms on the second floor, and passages and stairs going down to storage rooms. When a room such as the hall or chapel extended from floor to ceiling, a gallery often ran the length of the wall at the height of a second story. People could use these open walkways to reach other upper rooms.

The walls were made of stone, and a second story was formed by timber beams set into square holes in the outer stone wall. The second-story floor was wooden, but the ground floor was beaten earth, stone, or plaster. Carpets were not put on the floor; they were wall hangings only. Floors were covered with rushes and herbs to collect and cover the litter. Windows did not have glass, but they often had heavy shutters. Interior walls were often whitewashed, and, in great castles, the lady's room might have flowers painted on the walls. During the 13th century, **tapestries** came into fashion when Princess Eleanor of Castile brought Spanish carpets to England for her walls and floors.

Everyone ate in the main hall at long tables. The lord's family ate on a raised platform, called a dais. Most people slept in the hall, in the kitchen, or in other open rooms. The castle family had a separate room just behind the dais, separated by a curtain or wooden wall. In later castles, it moved to an upper floor and became not one room, but a suite of rooms.

Private rooms for the lord's family were solars and oriels. A solar was an upper-story bedroom. It was private, but it was also used by servants who slept on the floor or on cots. Depending on the size of the castle and the size of the lord's family, grown children did not necessarily have their own solars. They slept in dormitory conditions with their siblings and servants. An oriel was a small room, perhaps on a landing, often with a window. It was for any private use by the lord's family and led to the private sitting and drawing rooms in the houses of later centuries.

The fireplace was a castle innovation, beginning in the 11th century, necessitated by second stories over the main hall. The older central hearth had to vent its smoke through a hole in the roof, which meant the hall had to be open to the rafters. Subdividing a tower keep into stories required a new system. The fireplace was built into the wall so it radiated heat back into the room more efficiently than the central hearth. Chimneys drew the smoke through a channel in the stone wall, at an angle, to a loophole. During the 13th century, chimneys were built vertically to carry smoke to the roof.

Notable Castles

England had few castles before the Norman invasion of 1066. The victorious Normans built castles to defend themselves against the rebellious population of England. The most famous of William the Conqueror's castles was the square stone keep that is now known as the Tower of London. The first Tower was probably a simple fortress made of earth and wood, but it was replaced by the famous square block known as the White Tower for its whitewashed walls that made it clearly visible at a distance. It was built as a serious fortress; its outer walls were 15 feet thick at base. The entrance was on the second story and led the visitor into the great hall, which was 92 feet long. There were a smaller hall, a vaulted chapel, and some solars. In the cellar were the well, the kitchen, and storage rooms. It was used as a normal residence by English kings through the 12th century, and then as a refuge in times of unrest. It only became a prison after the end of the Middle Ages.

Château Gaillard was built on a cliff over the Seine River by England's King Richard I to guard his Norman territory. The castle took three years to build and was finished in 1198; it used all the newest Crusader engineering. The inner bailey came to the edge of the cliff, with the donjon's back to the cliff. The donjon sat on its own rock projection, elevated, and it was round with a triangular corner facing attackers. The middle bailey and outer bailey moved out from this inner fortress in a line, with a moat all around them. Their plinths were very thick, and the walls utilized the newly developed technique of stone machicolations so defenders could attack battering rams or miners. The moat enclosed the outer bailey so attackers had to cross drawbridges into and out of the outer bailey. The castle was thought impregnable, but by 1204, it had been captured.

Krak des Chevaliers in Syria, the largest and most powerful Crusader castle, was sited on a rocky hill. Begun by Crusaders, its outer walls were completed by the Turks who captured it. It was laid out in an irregular shape of walls that met at odd angles and towers of different heights, with inner slopes and ditches to leave exposed any attackers who crossed the outer wall. There was even a moat inside the outer bailey. Entrance to the fortress was by means of a long, narrow ramp overlooked by towers. A unique feature of

Edward I built a string of castles in Wales to guard his newly conquered territory. Castle technology was at its height, so the 13th-century Welsh castles, such as Harlech Castle, are among the most classic, well-developed castles in the world. Most are now in ruins. They were too expensive to maintain after their usefulness expired. (Jeremy Voisey/iStockphoto)

the Krak des Chevaliers was its lack of a formal donjon, or keep. Within the inner bailey, the buildings were laid out as residential, with a hall, chapel, and outbuildings.

During the 13th century, King Edward I of England conquered much of Wales and built a chain of castles to hold his conquest. The Welsh castles are in some ways the most typical medieval castles, built at the height of castle technology. Caernarvon Castle, on level ground, was surrounded by a wide moat. Its layout had eight defensive towers, with a large great hall in the inner bailey. It used the moat for defense; both main gates had drawbridges, and a third entrance was a water gate on the river. Harlech Castle is closest to a child's conception of a castle. Built on a hill, it was laid out in a square, with a round tower at each corner. Its inner bailey formed a central courtyard with the great hall and other buildings against the walls.

Castle Construction

Castles were not built with peasant labor, although peasants owed the landowners a certain amount of unpaid labor. Castles required skilled

construction out of the range of a peasant farmer. All through the medieval period, Europe's castles were built by experts, often with international reputations.

Construction was overseen by a master mason. These master masons were carefully trained and very experienced in all tasks of planning, measuring and surveying, stonecutting, and stone laying or bricklaying. They knew how to make arches, walls, towers, gates, and other castle features, such as latrines and fireplaces. Some masons, such as Master James of Saint George, mason of the Wales castles of King Edward I, were specialized in the military masonry of castles. Master James had trained in Savoy and was hired by King Edward I after they met while the King was on a Crusade. Other masons built castles, **cathedrals,** and all other stone buildings, but only in their regions. These master masons planned, built, and tinkered to improve designs and adapt to individual sites. The role of the architect as a planner alone only came about in the late Middle Ages, blending into the Renaissance.

Castle construction involved many laborers, and masons were usually in charge of hiring and supplying the labor. A king's castle might draw skilled workers from all over the region or country. A certain number of diggers and woodcutters might be employed locally, as well. Typical building contracts allowed the master mason a certain budget per foot of tower or wall, and it was his task to hire within that budget. Master masons themselves were highly paid. Contracts still exist, from all periods in the Middle Ages and in every region, but English records are the most complete. We know that many master masons were paid daily wages equal to or greater than a knight's wages.

Castle building was slow. Early motte-and-bailey castles, constructed of timber, could be put up quickly. During the invasion of England in 1066, Duke William of Normandy shipped precut, premeasured timber to England so his men could put up a fortress, a simple castle, in hours or days. Stone castles were slower work, of course. Under conditions requiring extreme speed, and by hiring every possible worker and sparing no expense, a castle could be built in 2 years. Typical castles were built in 5 to 10 years. Work cutting stone in quarries could continue in winter, but other building could only be done May through October.

Castle Warfare

Castles were both forward bases from which to mount attacks and last-stand places to fall back on. As long as a lord and his men were secure in their castle, they were unconquered. An attacking lord or king could only camp outside the walls and wait. Each side considered time an element of the fight. Either the attackers or the defenders could run out of food, and either side could receive help from another king or lord. It was in the interest of each

side to prolong the siege to use the weapon of time, and yet it was also in the interest of each to cut the siege short, since time could hurt both sides.

The attackers, after offering terms of surrender, began to assault the physical structure of the castle. They attacked from above and below. Attacks from above took the form of rocks, darts, and other projectiles flung with different types of catapults. These projectiles harassed defenders and damaged walls. Attacks from below meant digging tunnels under the walls, either to weaken and collapse the walls or to create a means of attack inside the walls. Attackers also assaulted the walls directly by climbing ladders in a human attack or by repeatedly hitting the walls or doors with a battering ram. Additionally, they sent in spies if they could or attempted to communicate with knights inside who might betray the castle gate.

The defenders, after declining the terms of surrender, did what they could to discourage the attackers. They mounted their own catapults on the castle walls and hurled rocks or garbage at the attackers. They stood in the hoardings or machicolations and dropped boiling water or quicklime into attackers' faces or armor. They tried to detect tunneling and blocked it or counter-mined to surprise the miners and beat them back. Their defenses did not need to be as active as the attacks, however, because the castle itself was their weapon.

If the attackers succeeded in breaching the wall, then a battle began inside the castle. Defenders would fight hard at the point of breach, but they would also fall back to an inner ring, where the assault would have to succeed a second time. When a castle was taken in battle, the defenders who were not killed in battle were often executed afterward. Knowing this, knights and foot soldiers fought desperately. A castle battle would include fire, many corpses, and much general destruction. After the battle, the winner might pull down the castle's walls.

Often, a siege continued without a breach of the castle walls. If either side received sudden reinforcements from allies, there would probably be a pitched battle outside the castle. The castle defenders might also choose to sortie, which was a sudden, direct attack on the besieging army. A sortie was not the preferred defense, since if it failed the castle would be left unprotected and would almost certainly fall. Many sieges ended with a draw. The attackers could not prevail, and both sides were running low on food. Winter was coming on, and the attacking army included peasants who could not stay away from their farms any longer. The attacking army would withdraw, leaving the besieged castle folk relieved, exhausted, and hungry.

Most besieged castles also sheltered peasants and nearby townsfolk. If given time to prepare, the peasant farmers would have brought their crops and animals into the castle. Their homes and any remaining crops were often burned so the attackers could not use them. A besieged castle was a crowded, dirty place.

See also: Crusades, Furniture, Knights, Latrines and Garbage, Sieges, Stone and Masons.

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Cathedrals

A cathedral is the church where a bishop presides, so it is usually located in a large city that was the diocese's governing center. The Latin word for the bishop's throne was *cathedra*. The name *cathedral* is often used for grand churches that are part of an abbey, but an abbey was the governing center of a monastic order, separate from the diocese, so technically these churches are not cathedrals. Bishops governed the region around a city or large town; in Italy, there were as many as 150, while in medieval England, there were about 20. Other European countries ranged between these extremes. France had around 75, Spain about 50, and Germany around 40.

A really grand cathedral was very expensive and took many years to build. Grandeur was a top priority in the medieval **church;** they believed that only the finest, most expensive, and most beautiful materials and craftsmanship honored God and the saints. When a church was built to honor a **saint,** the people believed the saint watched to see how well he or she was honored and would bring blessing to the community in proportion to the expense.

Bishops and kings could help finance a cathedral directly. In England, the Anglo-Norman nobility staffed the bishoprics and sponsored the buildings, often contributing heavily from their own funds. Many German cathedrals were built directly by the emperor, as well as by the duke of Saxony. Other

European kings of France, Spain, and Bohemia also directly funded cathedrals.

A large fraction of cathedral funding came from non-royal sources. **Pilgrims** left gifts for the saints, and some bishops had licenses to hold an annual **fair.** Bishops and the Pope could sell indulgences, especially indulgences for the sinful use of butter in cooking during Lent's **fast.** Regional lords bought these indulgences for their people, and these butter sales funded many churches. City trade guilds sponsored portions of cathedrals—for example, stained **glass** windows. In Pisa, the city built the famous Leaning Tower and its cathedral with the spoils of war against the Saracens.

Classical Style

The basilica, which means "royal hall" in Greek, was the public meeting hall of Roman cities. After the Roman Empire became Christian under Constantine, the basilica became the standard plan for an urban church. Its layout was simple. It was a rectangular hall divided into a central hall with aisles by two rows of columns supporting a weight-bearing wall that helped support the roof. The magistrate's seat or the altar was at one end. Some churches recycled columns and blocks from Roman temples that were falling into disrepair. Many early classical churches were built on top of cemeteries, originally to protect the grave of saints such as Peter. Burial crypts were automatically included in the design.

When the Christian faith spread into barbarian countries like Spain and England, huge basilicas were not a practical plan for new churches that served small populations. Churches were redesigned as tiny basilicas or **stone** versions of native building plans. Most floor plans remained large and simple but added side rooms. There was a preference for round arches and columns to imitate Roman design.

The basic church floor plan was a rectangular nave, the open area where people could stand, and a semicircular apse, the end where an altar would stand and priests would conduct a ceremony. The apse was sometimes on a raised platform with a burial crypt below. The apse was also called the choir, and it was where priests or monks sang the service. The common people were not permitted there; it was separated and screened off. The pulpit was in the nave so people could hear the readings and sermon.

Romanesque Style

Under Charlemagne, church building returned to the Roman model, but the Carolingians developed the basilica into a more complicated building. The basilica was still the main open hall, but, during the 9th and 10th centuries, it added rooms and floors. The first addition was a second apse (second

choir), and then basilicas began to have transepts, additions that ran perpendicular to the main hall, forming a *T*. The transept allowed the church to have separate chapels at each end, perhaps dedicated to specific saints.

As the Carolingian monasteries and parishes built larger churches, they added multiple stories; the main nave might be on the second floor, and there were frequently upper galleries with arched openings looking down into the nave. Corner towers held spiral stairs. The transept, turned into a multiple-story building, became known as the westwork. It was a building at one end of the main church that held choir rooms, chapels, and stairs.

The outside of these buildings was generally plain stonework, and most basilicas had towers at each end as well as other additions. Inside, the Roman tradition of arches and columns continued, but, in a region without Italian marble, different building strategies changed the look. Arches often rested on square columns plastered white with the rest of the wall. The arches were frequently part of the white wall so that the wall continued cleanly upward until it reached the upper gallery with its row of smaller arches of the same design. This upper row of arched windows was called the triforium. It could be a real second-story gallery or just a design element along a wall.

There were outbuildings in later basilicas. True cathedrals belonging to bishops had chapter houses attached, where the canons—the monks who sang the service—lived. A cathedral might have around 50 canons. Baptismal fonts and bell towers could also be separate rooms or buildings in a Romanesque church. The baptismal font was often housed in an octagonal room attached to the main nave. The octagon was a signature design element for this period and also was favored for mausoleums and chapels. Baptistries could also be separate buildings so that baptisms did not disturb the services in the main basilica.

Most churches had at least one tower that held a **bell** to call the monks or local people to services. The higher a tower, the farther the sound of its bell could reach. All through the period, **masons** built higher towers. The towers could be square, round, or octagonal. They were often decorated with layers of arches and columns, like a very tall wedding cake. The famous Leaning Tower of Pisa was its Romanesque belfry.

Romanesque churches did not all look the same, but they shared certain features due to the architectural methods of the time. Walls were thick to support the weight of the roof, and windows had to be relatively small. Windows were almost always arched with rounded arches. Indoor rooms almost always had arches and pillars of some design, whether square and plastered or round with carved capitals. Round towers and octagonal buildings also typified this style.

Decorative touches included imitation Roman capitals, stonework of alternating colors, and brass railings. Stained glass windows were not a main feature, although some churches had large, highly colored windows with

The famous "Leaning Tower" of Pisa was the bell tower for the Romanesque cathedral compound, which also included a baptistry. All were lavishly decorated with galleries of blind arches, instead of with the huge stained glass windows of later Gothic cathedrals. (Miklós Ebergényi/Dreamstime.com)

Bible scenes. There were also ceiling and wall **paintings** and sometimes frescos painted into fresh plaster. Cathedrals had many beautiful objects: the bishop's throne of wood or even marble, **gold** reliquaries, exotic lanterns, objects of carved ivory and wood, and molded brass reliefs.

Romanesque buildings were usually built from local stone, which was colored red, brown, yellow, or gray by region. Many pillars built of stone blocks had patterns carved onto them at the quarry so they could be assembled quickly and would form large geometric patterns. Dressing stone this way was called ashlar technique, and ashlar stone was a signature of the period. The buildings were colorful and not at all uniform like the later gray Gothic cathedrals made all of Caen limestone.

The thick load-bearing piers inside a building, bearing the arches that carried the wall's weight, were often carved into shapes like clusters of columns. Masons sought to construct piers that were strong enough, that were made of components light enough to transport, and that were also interesting to look at. Some cathedrals, such as Durham Cathedral in England, had alternating designs. Some pillars were thick, round, and covered with

carved diamonds or chevrons, while other pillars were carved as clusters of smaller pillars.

Another ashlar technique on the outer walls was to use decorative arches that did not bear weight or have real openings. These "blind arches" and "blind galleries" were arches or galleries in half-round relief set against a solid wall. Superimposed galleries were rows of arches with real openings but immediately backed by a wall and not serving any purpose other than decoration. Since the walls of Romanesque churches had to be thick and bear heavy loads, they could not have many real windows and would otherwise have been solid, plain surfaces. Blind galleries could be designed in interesting sizes and geometric patterns, including arches that crossed each other in an interlocking pattern or rows of small arches under the roof's eaves. Pisa's famous belfry has superimposed galleries—row upon row of arches with the real wall immediately behind them.

The thick lower walls of a Romanesque cathedral led to the design of huge doorways in which the wall was cut back in layers to an opening only large enough for a real, much smaller, door where the wall was now thin enough to hang it properly. These doorways looked like a series of decorative arches within each other. The space below the largest arch was called a tympanum, and it often had a relief-carved **sculpture** showing a Bible scene. The tympanum reliefs were large, complex, and educational for the illiterate townspeople. They often showed the Last Judgment with the wicked being led away to hell.

During the Romanesque period, architecture became an increasingly skilled art. Early Romanesque churches were designed by bishops and abbots, who oversaw many of the building details personally. But as builders developed more refined ways to structure foundations, roofs, and walls, professionals took over the design and oversight. Master masons were generally the architects and supervisors, and many worked internationally. Advances in building techniques, and the development of this highly skilled class of master masons, led to the next stage in building great churches. Architectural problems faced during the period were mostly about the weight of their building material—stone.

Master masons who laid out a building's foundations had to be careful that the stone piers set into the ground were all equally strong. Arches transferred the building's weight onto these piers, especially at key points such as the crossing. If one pier was weaker, or if the ground was softer, the building would settle unevenly. In other cases, during church renovation, the builders were not sure how much weight the original piers could carry and sometimes built a tower too high. Then the tower and building might simply collapse.

One of the more difficult tasks learned in the Romanesque period was how to build a tower over the point where a transept crossed the main

building. At this crossing point, the ceiling had to be made of arches. It was difficult to build a tower on top of this structure, but the impressive appearance of a tower at this crossing point led masons to find methods. A low, round tower with windows provided light to the central area of the church. A taller tower could hold the church's bell. Many Romanesque crossing towers were octagonal, with several layers of arched windows.

Another structural problem was the weight of the roof. Until the 11th century, the roof vault of a basilica was usually made of timber. Wooden roofs did not last as well and were vulnerable to fire. It was common for a roof to catch fire if lightning struck the bell tower or if a bakery or even a candle started a fire. The roof of the new cathedral of Mainz caught fire on the day it was being consecrated in 1015, and, in 1174, the timber vault of Canterbury Cathedral burned down, forcing a major renovation. Stone supports and slate tiles were fireproof but very heavy.

The Roman solution was the barrel vault, essentially a series of round arches laid together to form a solid round-arch ceiling. Where a transept crossed, two barrel vaults crossed in a groin vault, where arches crossed from corner to corner and met at a keystone in the center. Both kinds of stone vaults were heavy and difficult to build, and their weight pushed down on the walls and tended to force them outward. Medieval masons could not calculate weights and forces and had to rely on experience to know what a wall could hold. Timber supports were built first, and then the stone arches were lifted onto them, until the keystone was in place and the timber could be removed. Stone vaults did not always hold, but masons worked out many building techniques that led to the advances of the Gothic period.

By the end of the 11th century, master masons had learned to focus careful attention on the structure of roof vaults. Simple lessons learned in smaller structures were applied to ever-larger buildings with more complex design. The limits of round arches were thoroughly explored by 1100. The first pointed arches were used in the 1088 design of a new church at Cluny. The ceiling was to be 100 feet tall, and they wanted many windows punctuating the thick walls. Probably borrowed from the **Muslim** world, pointed arches were more effective in transferring weight downward rather than outward as well. Even with these load-bearing pointed arches, part of the nave at Cluny collapsed in 1125, and, as the masons repaired the walls, they added the first flying buttresses to help hold up the walls.

Ribbed vaults, a feature of Gothic building structure, began to appear in late Romanesque cathedrals as decoration on groin vaults. The arches were still rounded, not pointed. Masons may have discovered by accident that decorating vaults with stone ribs made them stronger, which led the way to more daring architectural feats.

Aisle vaults began to develop the concept of flying buttresses. The aisle vault was a lower side building whose outer walls helped brace the high

walls of the main nave. The difference was that the structure sheltered genuine indoor space—the aisles—unlike the later buttresses.

By the end of the Romanesque period, churches that were popular pilgrim sites were being designed in the cross shape that became standard in later Gothic cathedrals. The rounded apse grew larger so pilgrims could walk around the altar and crypt where the **relics** were housed, and sometimes tiny chapels were added to this larger apse so pilgrims could sit and meditate near the relics. Near this large apse, a transept crossed the nave, usually with more small chapels attached.

The Benedictine abbey of Cluny is the greatest monument of Romanesque building. The monks at Cluny spent up to 10 hours a day singing the hours (prayers) and contributed to making the liturgy more complex. The abbey received many donations in exchange for prayers for the donors' souls. Because their spiritual role in the world was to offer continual prayer and praise, the monks at Cluny put much emphasis on the beauty of their church. A new church was built between 1088 and 1130, and it was one of the largest churches in Europe. It had a large choir, two transepts with separate chapels, and a large reliquary with an ambulatory walk around it and tiny chapels in the apse nearest the relics. From the outside, it was impressive, with an array of round chapels, arched windows, and rising roofs and towers in perfect symmetry. Four towers at the crossings and over the main transepts were octagonal, with rows of arched windows and steep pointed roofs.

Gothic Style

The Gothic style was not called so at the time; during the 12th century, it was just the new style. The term *Gothic* was used in a negative way by Italian Renaissance writers to associate the style with the uncultured premedieval Goths. The 12th-century style made use of all the new methods of architecture to place a building's supports on the outside and permit the inside to be tall, open, and filled with light. The high arched ceilings of Gothic cathedrals changed the acoustic properties of the rooms, which led to the further development of choral **music** and polyphonic harmony.

Abbot Suger of the monastery of Saint Denis, north of Paris, pioneered the style. Saint Denis housed relics of the Virgin Mary, and the abbot wanted the relics to have a very grand home. He wished the church to be rebuilt larger and more in line with his vision of heaven. When the newly designed choir apse was dedicated in 1144, the abbot invited many French bishops to the ceremony. Many of these bishops soon after began building and renovation projects in the same style, which became the dominant style until the Black Death **plague** of 1350 made it difficult to find enough skilled masons.

Gothic cathedrals were staggeringly expensive. Materials and labor absorbed most of the region's disposable income for a century. They took a very long time to build. Amiens Cathedral was built between 1220 and 1269, which was very fast. Chartres Cathedral took about 75 years. Some took longer, a century or more, because work was started and stopped. By the 15th century, cathedrals were so covered with elaborate sculpture that they appear almost impossible to construct. Famous, classic examples of Gothic art and design include the cathedrals at Amiens, Bourges, Paris, Strasbourg, and Gloucester. Westminster Abbey in London is the greatest Gothic work in England.

A Gothic cathedral was always laid out in the form of a cross. Its geometry was designed around a central square that was doubled or tripled to find the measurements of the transept or choir. Arches, windows, and walls were divided into smaller units in each higher story. All details are related to other details in style and size to form a unified appearance. The plan was a celebration of mathematics and perfect regularity. The crossing, the open area of the main nave, often had a floor inlaid with **tile** that formed a labyrinth. Pilgrims were supposed to walk the maze to the center of the design. At Reims Cathedral, the archbishop's heart was buried below the labyrinth's center.

Carved stone was everywhere, along with elaborate stained glass and carved wood. Even in a brightly lit Gothic cathedral, there are corners where light never reaches, but stone carvers still positioned figures or decorations there. Stone sculptures cluster around the grand door portals, in relief or close to full round. Stone traceries to hold stained glass windows, stone supporting columns and piers, and stone ribs in vaulted ceilings were all carved to look slender and even lacy. The style of the most heavily decorated stone is called Gothic rayonnant. In late Gothic buildings, the stone was carved to look like feathers, fans, or leaves.

The windows held by the stone tracery were round or even cloverleaf, and they were often small. The first real window tracery was designed for Reims Cathedral in 1211. It pushed architectural plans to become more precise with the use of drawings and templates. The stone pieces had to fit together very exactly when raised to fit into the window frames.

The Gothic was the period of stained glass. Gothic cathedrals were flooded with light to imitate heaven. The windows were all filled with colored glass as picture windows telling stories in a series of panels or as giant rose windows. The rose window dominated a wall, usually above the front door. Its design was a complex pattern of circles, diamonds, flowers, and human figures such as saints or apostles. A row of tall, arched stained glass windows usually ran underneath the rose window. Tall, arched windows also filled the main walls. The chapel that King Louis IX built to house the crown of thorns, the Sainte-Chapelle, is nearly all stained glass windows, 50 feet tall, with sufficient wall space only to support the windows.

The key to Gothic cathedral building was the use of arches, ribbed vaults, and external buttresses to hold the roof and walls without inner walls or columns. Pointed arches are stronger than round arches; they can be of uniform width while topping columns of different heights. They shift the weight directly downward onto their columns and piers. The walls of a Gothic church were made up of a series of arches and columns, each layer smaller than the last. The series of arches and piers was stronger than a solid wall and allowed for more windows.

Ribbed vaults used a skeleton of stone arches that crossed in the middle of the ceiling, forming *X*'s, and rested on columns. The point where the ribs crossed was called the boss and was carved as a circle. The ribs bore the ceiling's weight more efficiently and required less heavy stone. Several arches could rest on one column so that fewer columns were required to hold up the ceiling. A typical ribbed vault had six arches: two transverse arches, two lateral arches, and two diagonal arches that crossed in the middle. The diagonal arch was a refinement of the groin vault's joining of barrel arches going in perpendicular directions, but the joints of a groin vault had not been load-bearing arches. The ribbed vault placed skeletal, weight-bearing arches in these places. Builders then filled in the spaces between the arches with cut stone without needing massive timber forms.

Gothic ribbed vaults also used pointed, not round, arches. This gave builders more flexibility, as the arches could span wider or narrower distances without affecting their height. Roofs could be built with a fan of pointed arches leaning to one boss, roofing a large ambulatory around a reliquary. Ribs could span irregular spaces, rather than just squares, octagons, and circles. The ribbed vault of Canterbury Cathedral has extra ribs spanning between ribs, forming smaller triangles and irregular hexagons. The most elaborate rib vaults were called fan vaults, and the ribs were so many that they could be individually thin and appear as delicate as lace.

The weight of a roof pushes a building's walls outward. When a building rises higher, the walls must be strengthened more—either by being thicker or by being held in place. The Gothic church's style did not permit walls of such thickness that they would support the high roof because the builders wanted the walls to be as open as possible to allow in more light. They did not want supports on the inside that would block the view of the high windows and ceiling. The outside walls of the church had tall support piers leaned against them to buttress the walls from falling outward. These buttresses were built as a series of arches to transfer the roof's weight to the ground. They were called flying buttresses. They met the wall about one-third of the height from the top.

The strongest flying buttress was itself a tower, built separately from the cathedral and on its own foundation pier. As many as three arches connected the tower to the outer wall of the cathedral. The most heavily buttressed

Ribbed vaults in Reims Cathedral hold up the vaulted ceiling with far less stone than in previous construction methods. Three arches (transverse, lateral, and diagonal) rest on each cluster of columns. The thin stone ribs lean on a round boss, visible at the point of the *X*. The delicacy of the weight-bearing skeleton allows maximum space for windows. (Claudio Giovanni Colombo/iStockphoto)

buildings had a flying buttress between every large window, as many as 8 or 10 buttresses for the length of the church. These towers and arches were decorated with steeples and arches.

Gargoyles were decorative spouts on a gutter system; in German they are called *Wasserspeiers,* meaning "water-spitters." They had to be long enough to channel the **water** out away from the building, and, since everything on a Gothic cathedral had to be decorated, they were sculpted, even if some also contained pipes. When every other sculpture or painting in a cathedral was solemn and holy, the waterspouts were a chance for sculptors to add a touch of humor. They depict unusual or invented animals, like flying monkeys, or show demonic-looking creatures with arms and legs. They grip the building and lean out to spit water.

Mediterranean Style

Because Spain was caught up in the struggles of the Reconquest for most of the medieval period, cathedral building was not as routine as it was in France or England. Cathedrals were more isolated and more experimental, more based on French churches and often attempting to blend elements of style. The cathedrals of Burgos and Toledo come closest to the northern models; both were begun around 1220 and were directly based on French and German churches the bishops had seen on trips to France and Germany.

Italian cathedrals were somewhat different from those of Northern Europe. The Gothic style never caught on; they did not like the appearance of flying buttresses. Churches were more likely to have a separate bell tower (campanile) and baptistry. The baptistry was often octagonal; it could be nearly as large as the main church. Italian cathedrals favored domes, and their architects put most of their effort into building larger domes that would not collapse. In Italy, the city communes, rather than kings or bishops, built cathedrals. It was usual for the city to hold a competition for building designs. Artists and masons built models, sometimes large enough to walk through, which usually stayed on display until the church had been completed.

The cathedral of Milan was a blend of Romanesque and Gothic styles. The cathedral is wide, with aisles of lower roof levels acting as architectural support in place of flying buttresses. The external walls were decorated with the intensity of sculpture that characterizes the French Gothic, and there are a number of pointed-arch stained glass windows and a rose window. Orvieto's cathedral uses murals, on both external and internal walls, to a far greater extent than the northern cathedrals. The Byzantine tile mosaic tradition continued in some cities that had more extensive contact with Constantinople.

The Cathedral of Santa Maria del Fiore, Florence, had a competition in 1418 for how to build the dome of their half-finished building. The city's

problem was that the original designer had planned the largest dome in the world without any idea how to build it. It was too large to use timber supports, the way arches had always been built. Filippo Brunelleschi won with a model that was 12 feet tall and used thousands of **bricks.** The model even included sculptures and paintings inside. Brunelleschi's dome was double—an inner ceiling dome and an outer weather-shedding dome. Both domes were made of progressively thinner and lighter materials, such as tufa at the very top. He was able to build it without any inner support in 16 years.

The dome's stability depended on how the architect balanced forces of compression and tension. He used herringbone brickwork that held itself together and chains of stone and wood laid into the rising wall in circles to keep it from buckling outward. Brunelleschi devised special cranes assembled inside the dome to lift the blocks straight up. The masons working on the project wore the first safety harnesses on record as they worked at the lip of the rising dome.

The final keystone was the lantern structure above the top of the dome. The lantern, which bridged a 19-foot hole that had been left in the main cupola, was over 60 feet tall, providing some weather shelter for the window, and was capped with a hollow bronze ball and a cross. A bronze plate set in the window turned the cathedral dome into a sundial, with the measuring devices built into the floor.

See also: Bricks and Tiles, Church, Painting, Relics, Sculpture, Stone and Masons.

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Chivalry. *See* Knights

Christmas. *See* Holidays

Church

The Roman Catholic Church and Europe's Middle Ages can hardly be separated. The widespread, often fervent practice of a common religion unified a diverse region and gave it a common culture. The native cultures of Europe shaped the church in turn and gave it a distinctly different shape than under the Roman Empire. The same things can be said of the Eastern Orthodox Church in Constantinople. It also unified the lands of the East, especially the Slavic regions, and the different political and military culture of Byzantium shaped the Eastern church's culture. Nearly all literature coming from these regions during the Middle Ages refers frequently and centrally to religion.

The first great effort in the church was to convert the remaining pagans in Europe. Missionaries went in all directions, sent by both centers of the church. At the same time, the church defined its doctrines during the Middle Ages in response to old pagan practices or to new ideas the church accepted or rejected as heresy. The rift between Constantinople and Rome happened in several stages but was complete by 1054. Around the same time, the Roman church embraced the use of force when it commissioned the First Crusade, a decision that linked religion and military power for centuries to come. At many points in the Middle Ages, the Roman church in particular developed ways of reforming and governing itself. This was demonstrated most clearly in a succession of high-profile church councils and in the many monastic movements that began during this time. All through the medieval period, the church engaged in a prolonged struggle for power with the monarchs of Western Europe, and this struggle gave birth to modern ideas of the separation of church and state.

Medieval Missionaries

Monks from Constantinople went into the heartland of Eastern Europe, where they converted Bulgars, Slavs, and other tribes. Bulgaria and the Slavic regions became attached to Constantinople's governance, doctrine, and rites. Monks from Rome went to the English, Franks, Saxons, and Norwegians. Ireland already had a Christian tradition from late Roman times; they were converted largely by the preaching of Patrick, a Briton who had learned their language as a **slave.** The spread of Islam into Persia and North Africa between 600 and 700 prevented Christianity from spreading south and east of its Mediterranean-centered homeland. Significant conversions took place only to the north and west.

Missionaries generally went to the king first, and, if the king accepted the new faith, he enforced conversion for the rest. Faith was not viewed as just a personal matter, but rather as the identity of a nation. When a nation became Christian, the Pope or the Constantinople-based patriarch appointed a bishop (known in the Orthodox church as a metropolitan) to govern the local church, bringing it into the hierarchy of the larger church.

Some missions were peaceful, while others encountered hostility and difficulties. The Franks, in modern France and Germany, were converted first when their king, Clovis I, was baptized in 496. This early conversion of a Germanic tribe made the next mission attempt easy and smooth. When Pope Gregory's emissary, the monk Augustine, went to the English coast in 597, he found that the local king had married a Christian Frankish princess. The mission was welcomed by the queen, and the first church was established in Canterbury. All the Anglo-Saxon kingdoms became Christian over the next 100 years.

The conversion of the Saxons, the Germanic tribe between the Franks and the sea, was outstanding for coercion and bloodshed. Although the Anglo-Saxon missionary Boniface had made inroads with his mission between 720 and 754, the **forest**-dwelling Saxons remained mostly pagan and very warlike. Charlemagne attempted to conquer them and, after many frustrating setbacks, finally massacred thousands of Saxon prisoners in 782. He declared a death penalty for refusal to be baptized. Charlemagne's mentor, the English monk Alcuin, rebuked him for forcing conversion, saying that true faith could not be forced.

The conversion of the northern Germanic Danes, Swedes, and other Viking peoples came about in stages. First, around 911, a group settled on the northern coast of Frankish territory. Their leader, Rollo, agreed to become a Christian and help defend the coast against other marauding Vikings. The area he settled became known as Normandy—the land of the Northmen. Its capital was Rouen. The Normans quickly adopted Frankish ways: religion, customs, language, and names. They remained unusually warlike and became a dominant force in medieval Europe for years to come, taking a leading role in the Crusades.

Between 994 and 1025, kings of Norway established Christianity as their official religion. There was no special mission to the Norwegians; they learned the new religion from their old foes, the English. Iceland adopted the new faith by 1000, but Sweden, the heartland of pagan worship, was still not entirely converted by 1100. In both Norway and Sweden, there were forced conversions and some executions for refusal to convert.

The Visigoths of Spain had become Christians in the last years of the Roman Empire. However, they became converts to Arian Christianity, which later developed into Catharism. Arian and Cathar doctrines were sufficiently different from Catholic doctrine that the two branches were incompatible.

Eventually, the Arians agreed to convert to Catholicism, and the later wave of Catharism was stamped out with a brutal Crusade.

By 800, the heartland of Europe had been Christian for at least several generations. Still, the culture remained mostly conditioned by pre-Christian tribal practices. Ideas of government, family, and relationships to other nations were not much influenced at first by the Christian religion. By the end of the Middle Ages, the church was the foremost influence. Many of the church's teachings and rules were developed during the Middle Ages, as culture and church interacted.

For example, Frankish nobles until Charlemagne's time practiced easy divorce, polygamy, and incest. Charlemagne himself divorced twice and was married five times. The church's rules against divorce and marriage between relatives grew much more stringent. No divorce was permitted, except for in cases of adultery; no marriages were permitted not only between siblings or cousins, but also between even distant cousins. (The aristocracy began to use claims of too-close relationship as a means to divorce.) These rules were proclaimed all over Europe and lasted into later centuries, although they were first framed to deal with the Frankish problem.

Ruling Hierarchy

The Roman Catholic Church and the Eastern Orthodox Church, centered in Constantinople, both used a hierarchical form of government modeled after the Roman Empire. Overseers were appointed from above and had absolute authority within their districts. In the Roman Catholic Church, local priests had authority within each parish, which might contain several villages, a town, or only part of a town. A group of parishes was overseen by a bishop, whose church was a **cathedral.** A region's bishops were overseen by an archbishop, and over the archbishops were cardinals. Over all of them was the bishop of Rome.

The bishop of Rome, though technically a bishop, was the head of the entire church because he claimed a direct descent of authority from Peter, one of Jesus's disciples. He was called the Holy Father of the Church: *Il Papa* in Italian, and Pope in English. The Pope had absolute authority to appoint and remove from office, to forgive and condemn. Officially, the Pope in Rome was also the overseer of the patriarch of Constantinople, who in turn oversaw other patriarchs, metropolitans, bishops, and priests in the Orthodox Church of the Byzantine Empire. In practice, the Pope had nothing to do with the patriarch's rulings.

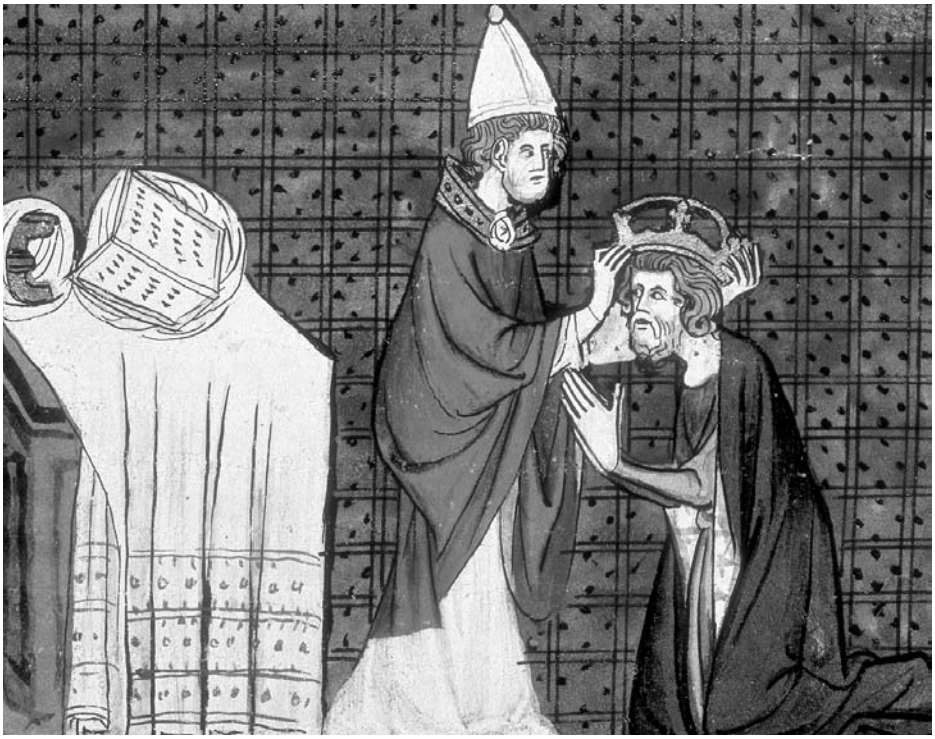
While other bishops retained their real names, Popes developed a tradition of taking a new name. Clement, Gregory, Nicholas, Urban, and Paul were very popular; they used Roman **numerals** to identify individuals. The Pope also became the secular ruler of land in Italy—the Papal States. There

was a palace in Rome, and later a **castle** at Avignon, France. Popes found themselves in military struggles with other rulers; they had to resist invasion as well as heresy. They were caught up in political battles as families and nations tried to gain the power of the papacy by having one of their own appointed or elected. While some Popes were devout men of prayer and scholarship, other Popes were worldly rulers who despised religion.

The Pope's authority was an evolving doctrine during the Middle Ages. From the earliest centuries, the Pope took a leading role in the church, and, by 865, Pope Nicholas stated in a letter that his authority came directly from Peter and included all Christians. In 800, Pope Hadrian crowned Charlemagne "Holy Roman Emperor" as a way of demonstrating the Pope's power over secular rulers. Still, a powerful king could appoint the Pope until a church council in 1060 provided that Popes must be elected by the cardinals. Kings still routinely appointed bishops, who also were secular rulers of large tracts of land, until a prolonged conflict between the Pope and the kings of France, Germany, and England over this right finally resulted in a compromise. Then, only the Pope could appoint bishops, but if they held land from the king, they would do homage for the land as a non-priestly noble would. The Pope gradually consolidated the rule of the church separate from and above the nations.

On the other hand, the Pope's power within the church was gradually adapted during the Middle Ages. Civil war in Italy and a power play by the French king led to a series of Popes based in Avignon, France, rather than in Rome, between 1309 and 1377. Pope Gregory XI died shortly after he returned to Rome, and the cardinals elected an Italian archbishop as Pope Urban VI. Pope Urban proved to be mentally unstable and often violent, and the cardinals met secretly to depose him and elect another Pope. Pope Urban responded by appointing a group of new cardinals who would support him. From 1378 to 1415, there were two Popes, each elected by rival groups of cardinals. This period is called the Great Schism. Europe was divided in support of the Pope in Rome and the other Pope in Avignon. As the years passed with no solution, and Pope after Pope died without giving in, the church at large began to seek a solution. A council made up of bishops, abbots, scholars, and many others declared that the Pope's power came from the church and that the church's members had the right to remove or appoint a Pope. Although this council still could not resolve the Great Schism, their declaration began to curb and define the Pope's authority.

Archbishops and bishops were powerful rulers in their zones of influence, and they lived in palaces. They were often called "princes of the church," and their social rank was equal to dukes and earls. Since they had the power to excommunicate secular rulers and place their lands under interdict, they could sway the secular state to do what they wanted. They also presided



The medieval world's political and religious parameters were set when the Pope set the Roman emperor's crown on King Charlemagne on Christmas Day, 800. Charlemagne's empire and successors had to be the Pope's military and moral supporters, while the Pope could claim spiritual authority above kings and emperors. This European balance of power was strained during the period when two Popes claimed authority. (The British Library/StockphotoPro)

over religious courts that had exclusive authority to arrest and try priests or monks for crimes. This power was often a serious grievance to kings and secular judges—some priests or monks became thieves and murderers, and the church courts refused to bring them to justice. The 12th-century martyrdom of Thomas à Becket, archbishop of Canterbury, was over his insistence that the secular courts could not try priests.

Priests who served at cathedrals as part of a religious order were called canons. They were celibate, but they were not under a vow to withdraw from the world like monks. Canons were installed, which meant they were literally assigned to sit in a stall in the choir. This was the canon's assigned seat at services, and it carried with it a stipend called a prebend (some canons took in more than one prebend). At first they lived in the cathedral's chapter house, but later they were permitted to live in private houses. Some canons were even considered secular canons because they did not directly serve in

the Mass. Secular canons could continue to own private property and were often very wealthy. They studied or taught at **universities** or administered charities such as **hospitals.** Chapters of canons elected their own officers and were self-governing, independent of the bishop. Secular canons could be involved in many things that we would not expect from the church. In the Flemish town of Tournai, the canons collected taxes on sales of alcohol.

Parish priests were at the bottom of the hierarchy, but they were the church's representatives to the vast majority of people. Some priests were educated at cathedral schools or universities, but many were not. They were educated in an apprentice-like training under a practicing priest and were then ordained by the bishop. They memorized the prayers and knew how to carry out rituals such as baptism, marriage, and burial. They led the central worship service, the Mass.

While bishops often lived like princes, common priests lived closer to their people. Some were married until the Second Lateran Council in 1139 declared that priests must all live as monks. There were riots in some cities when this ruling was made known because these priests were part of their villages and communities, and they had families who would be disrupted by the new ruling. Many priests were forced to put their wives into convents in order to remain serving as priests.

Monasteries were in a separate system. Each monastery had an abbot, or, in the case of a convent for women, a prioress. A monastery was part of an order, but this was less of a governmental structure. Each order had its own rules and way of life and often a certain way of dressing. Abbots reported to the Pope, instead of to the local bishop. The monastic system was not part of the normal parish structure.

The Mass

Mass was celebrated many times each day in cathedrals and abbeys, but usually only the monks and priests participated. The Mass was carried out in Latin. In a cathedral or a monastic abbey church, a male choir sang hymns in Gregorian chant, and the presiding priest preached a sermon that instructed the people in Christian living. The central event of the Mass was the Eucharist, also called Holy Communion, the reenactment of Jesus giving bread and wine to his disciples.

Medieval Christians believed that the bread (called the host) changed to the body of Jesus and the wine changed to the blood of Jesus in the most literal sense. As the priest pronounced the words in Latin—"This is my body"—he raised the holy wafer. There was a hush, and the church **bell** rang. The people felt they were witnessing a miracle. They believed the host had been turned into flesh and blood so devoutly that there were stories of the wafer giving off drops of blood. Some monks, nuns, and other

unusually devout people claimed they could taste the blood. The common people did not eat or drink the elements of the Mass, except for once a year at Easter.

Easter Mass in medieval England was the high point of the Christian year. On the Thursday before Easter, the priest consecrated (blessed) three pieces of host. Two were for his own use at that Mass and the Friday Mass, but the third was buried, with a crucifix, in a sepulcher on Friday. The sepulcher was a special box placed at the front of the church. The altar had been stripped and washed with water, wine, and a broom of twigs to symbolize the death of Jesus. On Saturday, the sepulcher was surrounded with candles, and, on Easter morning, the crucifix and host were taken out to symbolize the resurrection of Jesus. Each baptized person in the congregation then received a piece of consecrated host. Leading up to this, they had all gone to confession with a priest and had done penance for their sins.

The Mass was one of the sacraments—the rituals and acts that constituted the way of salvation. Baptism, confirmation, confession and penance, extreme unction (also known as last rites, the anointing of the sick), marriage, and taking holy orders were the other sacraments. Without these rituals, there was no salvation from sin and hell. When a person was excommunicated, he was not permitted to participate in the Mass unless he repented. When a bishop or the Pope laid an entire region under interdict, priests were not permitted to celebrate Mass or carry out the other sacraments. Churches were locked. To medieval Christians, this was the worst thing that could happen. Anyone who died without confession and last rites would go to hell, and no **babies** could be baptized during an interdiction.

Beliefs: Sin and the Afterlife

The church taught that sin condemned a person to hell in the afterlife. While some sins were venial, meaning forgivable and minor, most sins were mortal. A mortal sin separated the soul from God; there was a range of seriousness varying from skipping Mass to murder. The solution for a mortal sin was to confess it to a priest and do penance. Penance was a penalty set by the priest in exchange for absolution (the priest's assurance of God's forgiveness). The church published penance guides that listed sins in great detail and suggested appropriate penances. Historians can learn from these penance **books** which factors were considered to make a sin worse.

Penance might consist of charitable giving or prayers to be repeated by the sinner a set number of times. A **knight**'s penance might be a pilgrimage or joining a **Crusade.** "Taking up the Cross" was an assured way to heaven; Crusaders were given a plenary indulgence that wiped out all remaining guilt. Large amounts of confession and penance assured a soul's salvation, so a monk's life—filled with prayers, Mass, and charitable work—was con-

sidered holier than a lay person's. People believed a dedicated religious life meant assurance of heaven.

The medieval Christian believed the afterlife had three places: heaven, hell, and purgatory. Perfect souls who had confessed and done penance for all of their sins, and who thus died in perfect harmony with God, went straight to heaven. Heaven was a place of complete peace and happiness with God, the **saints,** and angels. Wicked souls who had committed mortal sins and did not confess or repent went straight to hell. Hell was a place of torment, pain, and eternal regret where it was too late to repent. Medieval people were very aware that most people were neither perfectly good nor completely wicked. Peasants and townspeople who had tried to live fairly good lives, and who had not perhaps remembered every sin when they confessed or who had died suddenly before a priest could hear their final confession, were not good enough for heaven but did not seem to deserve hell. It stood to reason that a third place existed for them: purgatory.

Purgatory was a place of sadness and discomfort, but not of torment or hopelessness. The purpose of purgatory was to finish the works of penance begun on earth. When repentance was complete, the perfected soul would be admitted into heaven. Most lay people assumed they would go to purgatory. They also believed that prayers for the dead would release them from purgatory more quickly. Many people left money to a monastery or church with the stipulation that the church offer eternal prayers for their soul, and many people prayed regularly for the souls of their loved ones in purgatory.

Toward the end of the Middle Ages, the church began to teach that the Pope could grant indulgences that reduced time in purgatory, usually by 40 days. Pardoners were traveling church officials who sold pardons on behalf of the Pope. They often preached a public sermon, first, to motivate people to buy these indulgences. Other indulgences could be purchased with donations to the church, sometimes even for building or fixing a **bridge** on church property. In medieval England, parish churches kept lists of all the people who had made charitable donations in order to be remembered in prayer. Once a year, this list—the bederoll—was read in public during a prayer for the souls of the dead.

Everyday Religious Practice

Although cathedrals command our attention, most medieval people attended small local churches. These buildings were designed with the entry facing west and the altar at the opposite end, facing east. They had murals painted on the walls that told Bible stories or stories of saints. Because most people could not read and might never see a Bible, these murals were their only book. Every church also had a large cross, displayed prominently, that always included a carved figure of Jesus nailed to the cross.

Romanesque churches were often decorated with wall paintings that told Bible stories to the illiterate congregation. Church frescoes were the only art that common people ever saw, and the colorful pictures made the distant Bible lands seem more real to them. (Giraudon/The Bridgeman Art Library)

Churches also had graveyards, which were important because the ground had been blessed, or hallowed. Some nobles were buried inside churches, in tombs under the floor or in the cellar. Their stone effigies and memorial brasses were placed along the walls or in special chapels. Cemeteries and other means of burial were the most important services the church offered since people believed burial in unholy ground kept the soul from going to heaven.

Every church celebrated Mass on Sundays, but attendance was patchy and varied widely. Parish priests lived in the village in a rectory. The **house** was not as grand as a manor house, but it was usually nicer than a peasant's cottage. The property and income of a parish priest were comfortable by village standards. Priests were supposed to be able to read and write, though not all knew how. Until the Second Lateran Council of 1139, parish priests were often married.

Besides attending Mass and confession at least once a year, the chief duty of a medieval Christian was to observe the **calendar** of the church. When the Christian religion spread into Europe, missionaries consciously adapted Christian beliefs and stories to the existing pagan rituals of the seasons. If the people were used to having a feast in a certain time, the priests found a saint whose day could provide a reason for feasting.

Fasts and **feasts** alternated. Because the church's ideal of holiness meant denial of the body's needs, there were more fast days than feast days. Fasting meant either no food at all, one or two very small meals, or meatless meals. The best-known fasting season was Lent, the 40 days before Easter. No meat or eggs could be eaten during this time. Fish was always permitted; at the tables of the wealthy, cooks served creative dishes with salted or fresh fish. The poor ate what they could, usually salted cod or herring.

Other fast days came into practice through the Middle Ages. Friday became a meatless fast day. By the height of the Middle Ages, there were so many fast days that for those who tried to observe them all, about three days per week would be fasts, if not more. King Louis IX of France, also known as Saint Louis, was observant of so many fasts that he finally made fasting his normal diet.

The best-known feast day was Christmas, and, following it, Twelfth Night. Christmas was not celebrated with gifts, let alone with pine trees, in the Middle Ages. It was a feast, which, for the nobility, meant minstrels and jugglers, music and dancing, and a very large meal. Other **holiday** feasts honored saints: Saint Crispin's Day, the Feast of the Holy Innocents, the Feast of Saint Benedict, Michaelmas to honor the Archangel Michael, and Candlemas, usually to honor Mary.

Another feast that has persisted into modern times is Carnival, the feast of eating meat before the Lenten fast began. Although it was not a religious feast, it became customary in many parts of medieval Europe. Carnival celebrations were rowdy and colorful. In Italy, a straw old woman was burned to show the death of winter and the old year.

Church life in towns included many public rituals and **drama.** People might act out the scene of Jesus's birth or conduct public processions for Palm Sunday and Easter. Traveling players put on scenes from Bible stories, telling illiterate villagers the stories of Abraham, Moses, Elijah, and Jesus. At York, England, the feast of Corpus Christi was celebrated with a play that showed scenes representing the entire timeline of the Bible. These mystery and miracle plays were sometimes comic, in spite of their religious nature.

Between 1347 and 1405, waves of the **plague** now called the Black Death swept across Europe. Among the many changes in society that the recurring plague created, the ideal of holiness seems to have changed. Burial and prayer societies started in many cities, sometimes in the craft **guilds,** and were often called guilds on their own. The members agreed to pray for each other's souls and the souls of the dead. Throughout the next centuries, these guilds often sponsored general prayer meetings. The members were not priests or monks, just townspeople with ordinary jobs. It was a new idea that their lives could be dedicated to prayer although they had not withdrawn from the world.

Roman Catholic and Eastern Orthodox

The fall of the Roman Empire separated Rome from the Eastern centers of the church. After Antioch, Jerusalem, and Alexandria fell to **Muslim** invaders, only Constantinople was left as an important church center. Its culture and government claimed continuity from Rome's. Under Constantine, the emperor had been the head of the church, which continued in Constantinople. While the Western church adapted to deal with barbarian invasions and kingdoms, the Eastern church remained centralized and traditional.

The cultures began to drift apart as their monastic traditions, worship rituals, and theology grew independently. In 857, Emperor Michael III deposed the patriarch of Constantinople and appointed a new one. Both patriarchs, old and new, appealed to the Roman Pope to settle the matter. The candidate who lost accused the Pope and the Roman Church of heresy, and there was less communication with Rome after that.

The final break came when the Roman church gradually added a phrase to their official statement of beliefs. It was aimed at the kingdoms that had adopted the Arian Christian faith. Arians did not believe Jesus was fully God, so the Roman church began to state that the Spirit proceeded from both the Father and the Son (*filioque*) to emphasize the equality of Jesus. The Eastern church did not face the same set of problems, and the decision to include the phrase did not ring true with them.

The split was official in 1054, when the patriarch accused the Roman church of errors and closed Latin churches in Constantinople. Both sides ended by excommunicating the other. Each church used a term that suggested that it was the true, original church. In Constantinople, they were the Orthodox, which means "correct teachings." Rome's church called itself Catholic, which means "universal."

On the eve of the Turkish assault on Constantinople, there was a widespread church conference in Florence, Italy. The attendees made a serious attempt to negotiate the reunification of the church. Both sides, Catholic and Orthodox, agreed to set aside their differences. But two months later, Constantinople was in Turkish hands, and the agreement was never put into practice.

See also: Cathedrals, Crusades, Drama, Fasts, Holidays, Monasteries, Pilgrims, Saints.

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Cities

Europe's Middle Ages were a time of settlement and development; at the start of this period, most of Europe was forested with few people, while by the close of the Middle Ages, it was filled with industries and great cities. Most of these cities were built during the Middle Ages and were established by 1300. Even so, by far most of Europe's population still lived in the country.

While Rome and some Italian cities inherited their streets, plazas, buildings, and plumbing from the Roman Empire, other medieval cities had to build and invent from scratch. At the beginning of the period, there were few industrial goods, and most exports were raw materials such as wool. By the end of the period, some northern cities were producing highly refined goods to trade with the rest of the world. Some cities were commercial hubs with international banking and hundreds of foreign merchants and artisans.

The Growth of Towns

At the beginning of the Middle Ages, most people lived in the country on small farms or estates. People in the country were nearly always attached to the estate of a lord, owing service and needing permission to move. When a town grew up on a lord's land, he granted it a charter of freedom so the people of the town did not owe service and were considered free. The citizens of the town then could make their own laws and hold their own courts. A new middle class grew in the towns, detached from the land and living by their personal job skills.

Most cities grew up around a walled fortress that could offer merchants and craftsmen a refuge against attack. Often, a marketplace developed outside the fortress's walls, which attracted more settlement. Towns then became centers of trade, with regional specialties. As types of trade shifted, towns grew or stagnated. Some grew at a sea or river port, while others grew at the crossing of two major **roads.** A place on a river that offered a ford or a place to build a **bridge** usually became a major town. Some grew because of raw materials that attracted industry. Still others were planned from the start by ambitious rulers.

Towns that began outside a castle's walls often built their own walls when they had a town charter and the means to afford it. This was especially true in a time of civil war or outside attacks. Sometimes walls were ditches and wooden palisades, while other towns could afford full-scale **stone** walls with crenellations. As the cities outgrew their walls, people built again outside the walls. These extramural villages grew until they functioned as an important part of the town's economy. In many cases, towns could allow new areas to grow without defenses, but other cities built larger walls to encircle and protect the new settlements. Florence built three rings of walls as the city grew during the Middle Ages. Defense was a serious matter in the war-prone cities of Italy. Within the city of Florence, aristocratic families built defense towers among their houses, and groups of commoners came together to build their own defense towers.

In the late Middle Ages, some areas in France and Italy began to develop planned cities, laid out by an urban planner and built to specifications. These planned cities had public squares and wider streets and were carefully laid out on a rectangular grid. The public squares were used for **drama,** meetings, and festivals. Even in England, some towns were planned as market centers and had streets laid out on a grid. The size of building plots was usually controlled by the town government.

Medieval towns typically had very wide main streets, since these streets also served as marketplaces. Although medieval sections of European cities have narrow streets, this may be a feature of later overbuilding during the Renaissance. Narrow alleys usually cut through the backs of building plots, allowing foot and **cart** traffic. In addition to the street's use as a market, there was usually at least one dedicated market, often more. These open areas were between 50 and 150 feet wide, allowing room for livestock and carts. Over the 12th and 13th centuries, these market spaces were filled with guildhalls, chapels, and eventually **houses** and shops. New markets had to be opened outside of towns.

Large towns developed a number of churches and marketplaces and often became **cathedral** towns. By the 13th century, as their populations grew into the tens of thousands, they could be considered cities. They usually minted **coins** and had a **prison** and courthouse. The problems faced in

The old city of Carcassonne, in France's southern region of Provence, retains its medieval form. The original medieval wall was a double concentric ring with 50 towers. After it was conquered during the Albigensian Crusade, the city fell out of the mainstream of modernization. During the 19th century, enough of the original wall remained, though in bad repair, that the city fathers chose to rebuild it as a historical monument. Pictured here is the main town gate with its outer ramparts. (iStockphoto)

administering a medieval town as it grew into a city passed what a council could handle and required an administrative bureaucracy.

The governing rights of a city varied across Europe. After central government fell apart in the 11th century, the cities of northern Italy were entirely self-governing and could make their own currency, maintain armies, and go to war against each other. Some even bought feudal rights to the surrounding countryside, enlarging their republic's domain peacefully. The typical Italian city was governed by a council and a *podestà,* a hired administrator who came from another city commune and was not related to any of the dominant extended families in the city. By the 14th century, this official was only a temporarily hired judge, but at times he had full governing or mayoral power.

In France and England, central governments maintained control over cities but permitted them to establish their own courts and administrations. London's city government became powerful enough to threaten the king's

power at times; the mayor was elected directly by the trade guilds. The guildhall was the center of London's government. Louis IX of France chose mayors out of a selection of candidates that the cities could propose, permitting cities little independence. Barcelona, reconquered by the Christian kings, became self-governing in its maritime commercial district so that international commerce would be unaffected by local politics. German cities were often largely autonomous within the German empire.

The appearance of medieval cities varied as widely as their individual histories and regional building materials, but some generalities can be made. Housing for the poor was nearly always made of wood and was very much in danger of fire. Fires at times wiped out large sections of cities, from Constantinople to the smallest northern market town. In places where stone was plentiful or **brick** was easily made, towns encouraged building with these materials where possible. The average Northern European city was built mostly of timber framing with wattle and daub walls.

Chimneys were not included in urban planning until the late 14th century, so **houses** in town had to cook with care. Kitchens were best planned outside the main building, but, in a crowded city where the poor lived in flats, this was not possible. Heat came from wood or charcoal. The air in a medieval city was filled with smoke from home and business fires. In winter, most rooms inside were either cold or smoky. Windows did not have **glass** until after the Middle Ages, except in the most expensive urban homes. They were open and shuttered or covered with oiled parchment or thin slices of horn.

Many houses kept small **gardens** or even fruit trees in the small plot of land attached to the house. The kitchen garden often grew cabbage, leeks, chives, garlic, and herbs like sage, parsley, and fennel. Roses and violets were not just flowers; they could be distilled into flower syrups for flavoring. The cesspit and well were also located in this small area behind the house.

Streets were mostly dirt. Rome's streets were paved, as were the major streets of many other Italian towns. Cordoba, Spain, paved its streets during the period of **Muslim** rule in the ninth century. Paris paved its streets during the 12th century, starting first with the principal streets of the *Cité,* the original citadel on an island in the Seine River. Paved streets were cleaner but required expensive upkeep when the stones broke under the heavy loads carried through cities. Some large cities had sweeping services, while others mandated that residents and shop owners take responsibility for their block.

Most city neighborhoods had a well that had been dug at the time of settlement, and some houses had wells. Big cities had public wells and piped **water** to neighborhoods without wells. Increasingly, they also had to carry away **garbage,** as well as provide services such as a night watch and magistrates to keep the peace.

Towns and cities mixed businesses and residences closely, since people nearly always lived in or near their businesses. Some businesses were moved outside the walls because they created waste (butchers and tanners) or fire hazards (blacksmiths). Many kinds of businesses became concentrated in certain districts of a town, controlled by their guilds. Others, such as bakeries and cookshops, remained spread through city neighborhoods and parishes.

Cities were also full of daily markets. There were shops and booths, and criers went about selling wares in the streets. A town housewife could count on having criers walk by all day, calling out for cabbage, onions, apples, imported lemons, spices, bread, and ale. Many cities had vendors who sold hot food and cried out things like "hot pies!" and "smoked eels!" Additionally, there were other criers, such as **beggars** and lepers ringing bells or shaking clappers. Some cities, such as 14th-century London, regulated the prices of basic necessary **foods** such as bread and ale.

Trade **fairs** permitted local and foreign merchants to mingle. A fair lasting several weeks was held at a certain time every year so people could plan for the display or travel. The fairs across Flanders were coordinated so merchants would have time to travel between them. Some fairs grew so large that towns grew just based on hosting the fair. In the 13th century, the count of Champagne, in northern France, organized six fairs per year so the region became a trading hub. The towns and cities collected tolls, fees, and taxes on all these activities.

One of the key traits separating a medieval town from a Renaissance town was the presence of **animals.** Towns grew from villages, and people assumed the right to keep all sorts of farm animals and to carry out all sorts of animal-related trades, such as butchering and leather tanning. Dead animals, when not eaten, were buried on the owner's lot, and animal waste went into the street. A medieval town or city was filled with crowing roosters, squealing half-wild pigs, and dung everywhere. During the 15th century, the growth of large towns forced city governments to sharply curtail animal care. Streets had to be kept clean, and animals could not be buried inside town walls. Many farm animals, such as pigs, were banned altogether.

Medieval cities and towns often had unique festivals, in addition to the universal ones such as Christmas. Every parish had a patron **saint** of its church, and every city claimed its own patron saint. The patron saint's day on the liturgical **calendar** was a day of feasting and civic pride. Businesses and schools closed, and construction work stopped. Festival always had a religious component, usually a procession of the church's holy **relics** through the town or around the basilica. There was always a special Mass in honor of the patron saint. Secular activities always involved large amounts of food, in some cases hosted by the town government and in others by guilds or the

local lord. In Italy, these festivals usually meant **horse** races right through the middle of town. In other towns, they meant entertainers with performing animals or group games such as mock battles. Guilds often put on miracle or mystery plays. At the very least, a town usually had a fair to honor their patron saint and collect annual trading tolls.

Great Medieval Cities

Constantinople

The greatest of the medieval cities was Constantinople. It was the largest and most populous city, as well as the center of an empire. It was also a major manufacturing center. Before the 11th century, the city was a closed market that housed foreign merchants in a special part of the city and did not permit them free access to its goods. It was not a typical medieval city; it was on the fringes of medieval Europe, although it was at the center of its own world.

Medieval Constantinople was not well studied as a city, even in its time; foreigners had such a limited view of it that their reports tended to emphasize either the glories of the churches and palaces or the squalor of the section of the city where they were lodged. Its chief strength lay in its location. It was able to charge fees and duties on a wide variety of merchant ships

Before its fall to the Turks, Constantinople was the most heavily guarded city in Europe. Even with water (either sea or river) surrounding most sides, the city was entirely ringed with multiple heavy walls. Its heaviest gates faced the side unprotected by water. Constantinople was also the most populous city in Europe; its streets defied a medieval map maker's skill. As a center of both manufacture and commerce, the city was a maze of shops, alleys, warehouses, and ethnic quarters. (E&E Image Library/ StockphotoPro)

passing through the Strait of Bosporus. This, rather than its own merchant fleets, was probably the source of its wealth. Further, its location on the point of the Golden Horn was easy to defend against invasion. The few successful attacks depended on treachery inside the walls, such as someone opening a gate. Until the invasion by the Fourth Crusade in 1204, Constantinople had never been ruined. Its concentric walls were an engineering marvel and impervious to pre-**gunpowder** attack, and the city routinely used Greek fire in defensive catapults. After the Turkish invasion in 1453, when enormous cannons battered the outer walls, much of the medieval character of the city was altered, and many **records** were lost.

Constantinople's infrastructure was developed beyond the possibilities of newer cities. Situated on a large body of salt water, it had only one small river bringing fresh water, so the city built a large network of aqueducts that went over and under the city walls. Underground cisterns large enough to fit modern sports fields ranged under the city streets, supported by pillars and vaulted roofs. The city government also purchased grain from all the territories it ruled and stored it in warehouses to ward off shortage. Local fishermen were required by law to sell **fish** only to the city. Constantinople's absolute ruler, the emperor, had power to tax and regulate beyond the more limited powers of the Italian communes or the feudal cities of Northern Europe. Both city services and the emperor's extremely luxurious lifestyle were funded by direct taxes on land and business activity.

Constantinople had a rigid class system protected by sumptuary laws. Types of **cloth** and **jewelry** were designated as appropriate for certain classes, and the laws appear to have been enforced at the point of sale. A large number of goods were not permitted to be exported, since the Byzantine aristocracy preferred to keep them as markers of their privilege. This included some kinds of silk that inspectors confiscated if anyone tried to buy them to load onto ships.

The poorer sections of the city were dark, dirty, and crowded. The city grew very fast and without controlled planning. Tenement buildings were often four stories high, with a family (and sometimes animals) in each flat. They were built without regard to sanitation and health, too close together, blocking the sunlight. The overwhelming tide of poor residents sometimes turned to mob violence, especially during political coups or against foreigners.

Constantinople had a very large population of foreigners from its provinces and trading partners. Although the movement of foreigners was tightly controlled, certain sections of the city were allowed a Venetian or Jewish quarter. A number of foreign churches were in these neighborhoods, including mosques and synagogues. Foreign neighborhoods were not in the best areas, which were reserved for privileged Byzantine natives.

The city also had more public institutions than its peers in Europe. There were large prisons at a time when other medieval cities had nothing more

than gatehouses. The Roman tradition had provided them with a hippodrome for public chariot races and other kinds of entertainment; the entertainment, such as animal fights, was often violent. Christian emperors endowed **hospitals** during the 11th and 12th centuries. These hospitals were primarily for the poor, since the wealthy could afford nursing care when they were sick or injured. Some hospitals functioned as orphanages or nursing homes for the elderly, but some were organized around treating specific illnesses and injuries. Surgeons' and physicians' fees were paid by the state.

By the 14th century, when the Northern European cities were coming into their own, Constantinople was struggling. Its territories had been lost to Muslim invasions, and it had become an embattled fortress. Many of its luxuries and relics had been stolen by Venetian sailors and Crusaders in 1204, and the city had never quite recovered. It was a shrinking power when the others were expanding.

Venice

Venice had the most unusual building site and history among the European cities. Founded by Roman refugees from the barbarian invasions, it was built on a cluster of small islands just off the shore of Italy. Several rivers had created deltas out from the shore in irregular shapes dotted with islands, and long barrier islands protected the lagoon from sea waves. Venetians used the water as a natural moat and built their city on the close-lying Rialto islands; the water between the islands became the main canals. By draining marshy land and building artificial canals, the residents made the most of the islands' size. Most early buildings were wooden, built from pine trees on the mainland shore. In many places, logs were driven as piles into the soft ground to form platforms firm enough for stone buildings.

From the start, Venice aimed at becoming one of the leading cities of Italy. The city's first claim to international fame was its ninth-century acquisition of the body of Saint Mark, writer of the Gospel of Mark. His symbol as an evangelist was the lion, a symbol Venice took for itself. Saint Mark's Basilica is one of its greatest buildings. It was built in the Byzantine style and is still famous for its mosaics.

The Doge's Palace (Duke's Palace), built on the water, was rebuilt several times until, in the 14th century, it became a jewel of Gothic style. In honor of Saint Mark, the doge kept lions in a courtyard, and some public viewing was permitted. In 1316, the lioness gave birth to visibly living cubs, although bestiaries confidently informed readers that lion cubs were always born dead and were brought to life after three days by their mother's licking.

Venice built more **ships** than any other European city. Its commercial power was based on trading ships, and it had no fighting men except for

its navy. The Arsenal was a fortress that served as a shipbuilding workshop. It was built on two small islands that became part of the main island complex through land reclamation, canals, and bridges. The word *arsenal* came from Arabic *dar sina'a,* "house of construction." Within its walls were large square bays, docks, and workshops for blacksmiths, carpenters, and rope and sail makers. The new rib-and-plank construction method of the 12th and 13th centuries began in the Arsenal; ships were built around a skeleton, rather than upward from the keel.

The city government, under the doge, may have been the largest, most controlling government in Europe. The Arsenal's workshops were owned by the Republic, as were all the ships it built. The doge had a network of civil servants, lawyers, notaries, tax collectors, and inspectors. In the 14th century, the city had free hospitals and a medical school. Venice's surgeons were required by law to meet and discuss cases to share their knowledge. There was a service for identifying and assisting (and no doubt watching) travelers and strangers. Garbage had to be collected by canal boat, a highly organized city service. When the Black Death came to Venice, the city's social infrastructure was among the few that held up during the crisis. Garbage collections, including for corpses, never stopped, although the boatmen themselves were as hard-hit by the **plague** as anyone.

In the 14th century, the islands continued to have open spaces for fisherman's cottages and gardens. Venice never had large-scale farming of grain, but, as in other European cities, there were many vegetable-farming plots. Packed-dirt streets crossed the canals with drawbridges. Although the city had many fishing boats, the canals did not yet have the city's beautiful Renaissance gondolas. However, Venice's canals were the first European streets to have **lights** at night. In the early 12th century, the doge ordered the city to pay for lamps to stand in the many saints' shrines at canal intersections and along the main routes. Parish priests were responsible for maintaining and lighting these lamps.

London

London of the 14th century was still a walled city with seven gates. Two of the gates had prisons built into them. The city had a curfew. At about nine at night, the city gates closed, and **taverns** were supposed to close. Workshops had closed at sunset since guilds prohibited work by lamp or candle. The city employed guards to pace the streets, keeping order. Even in the late Middle Ages, most city people lived inside the walls, and outside the walls was largely countryside. Suburbs were built after the Middle Ages.

London had many small **church** parishes; people attended the nearest assigned parish church so that parishes functioned as cohesive neighborhoods. There were over 100 parishes in 14th-century London. The city

was divided into 25 wards, each comprising several parishes, which functioned as governmental units. An alderman, a beadle, and sergeants heard disputes between neighbors, regulated building codes, inspected shops, and carried out sanitation measures. Each ward kept records of its inhabitants, registering new freemen as they moved into the ward.

The typical city house at this time had three stories, each ranging from 7 to 12 feet tall, and was about 12 feet wide along the street. Wealthier merchants owned houses and shops with more frontage along the street and rented out some shops while enjoying the larger lot's back courtyard for their families. In the 12th century, London outlawed thatched roofing and stipulated that walls of adjoining houses must be thicker than the usual wattle and daub; they must be three feet thick. Upper stories could be cantilevered out over the street as long as they allowed a nine-foot clearance for a man on a horse. These projections were called penthouses. In some cases, a building rented its floors as flats, and each upper-story flat was reached by a ladder or stair on the outside. Neighbors had to be careful not to dump wastewater on each other's heads or balconies.

When a family occupied all floors of their building, the shop was on the ground floor and at the front, with a hall behind it and the kitchen at the back. The hall was still the main common room, as in the plan of a castle or manor with its grand hall. It had a fireplace and an eating area. Valuables were kept locked up in the master's bedroom on the second floor, and the master's children also slept in this room. As in a castle, this private room on the second floor was called the solar. The third-floor garret, under the peaked roof, was the room for servants and apprentices.

Many flats and houses in the city belonged to the church, having been left as donations in wills. The church rented them to families or to the poor, depending on their condition. People often rented single rooms and usually had their food (their place at the "board") included with the room.

Shops along the street had colorful pictorial signs, and taverns marked their trade with a green bough. Most shops had shutters that projected into the street when they were open for business. Some built displays out into the street, but these booths were supposed to be portable (able to be taken down at sunset) and not project more than three feet into the road. The main window, with its open shutters, had a shelf where the shop's wares were displayed. The artisan sat near the window, using its light to continue his work. He was able to keep an eye on his displayed wares and talk to customers who stopped to look.

City neighborhoods were not socially stratified in medieval times. People lived above or in their shops, and they had to be able to buy what they needed within walking distance, so every ward in London was crowded with many kinds of businesses. Craftsmen, tavern keepers, and prostitutes lived in the same block. Brothels in London were called stewhouses (like com-

mercial bathhouses) and were not legal, but they operated in a gray area as long as they were not nuisances. Many prostitutes operated out of taverns fairly openly.

On the other hand, some trades clustered in places. Merchants and fishmongers clustered near harbors and docks. Smelly, polluting trades like butchering and tanning were usually restricted to a certain area, often just outside the oldest town walls. Butchers and merchants usually did well, so although these sectors of the city were closest to their trades, they had the grandest houses and cleanest streets.

Paris

Paris began as a citadel on an island (*Île de la Cité*) in the middle of the Seine River. During the early 13th century, King Philip II built a new, larger wall around Paris. The new wall defined a city that spread onto the riverbanks around the island, nearly half a mile on each side. At the time, the Right Bank included a number of farms and villages, and the Left Bank was dominated by vineyards. There were six gates in the wall on the Right Bank and five gates on the Left Bank. The king planned for the city to grow into its new walls, and, by the 14th century, it had filled them. The Right Bank grew faster, and its wall had to be expanded. In time, it became the main city. The Left Bank came to house the university.

Streets in Paris were sometimes named for the activities that took place on them: a **minstrels'** school gave the *rue des Menestrals* its name. Others were named for saints or for earlier vineyards or farms. Most were dirt, but Philip II ordered the main streets to be paved so they could be cleaned more efficiently. Residents were supposed to pave the streets by their houses or shops, but few did. Streets were maintained and cleaned with tolls collected from merchants going in and out of the city gates. The bridges to the central island were also toll points.

Titled aristocrats such as the duke of Burgundy maintained mansions in the city. These palaces had galleries linking their wings and rooms, gardens with fountains, and hundreds of servants. In French, the grand houses were called *hôtels,* but they were not inns. As the city of Paris grew, some merchants or civil servants of the king grew very wealthy and formed an urban aristocracy without titles. Mansions inside the city were built on several lots or by renovating several existing houses into one unit. Lower rooms were *salons,* great halls for receiving visitors. Ostentatious displays of wealth required costly imported fabrics, exotic animals like peacocks, and leisure equipment such as board **games.** Upper chambers had windows with views of the city, since these mansions were taller than other houses.

Working-class houses, usually rented, filled most of the city. As in other medieval cities, some trades clustered in convenient places, but others mixed

into all neighborhoods. Artisans normally worked on the ground floor of the houses they lived in, with front window access to customers in the street. Single families lived in these houses, as a rule, but extended families often gathered in the same block.

Women seem to have carried on trades in Paris more freely than in some other places. Lists of Parisian taxpayers include women who kept taverns, sold grain, wove and embroidered, and sold groceries or vegetables. Most worked in a cloth-related industry, such as dressmaking, silk spinning, or laundry. Some may have been carrying on their husbands' businesses, such as **pottery** or glazing. A few worked in medicine as nurses or midwives.

See also: Gardens, Hospitals, Houses, Latrines and Garbage, Prisons, Roads.

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Climate

The climate of Europe during the 1,000 medieval years went through several major changes. Climate scientists usually speak of two main periods when it was first warmer, and then colder, than Europe's historical average. At some point in the early Middle Ages, Europe warmed—a period called the Little Optimum, or the Medieval Warm Period. After 1300, the continent experienced a long, intermittent period of overall colder temperatures and harsher weather. The average temperatures were not dramatically

different—not more than one degree Celsius warmer or colder than in the 20th century—but the difference was enough to make dramatic changes in human life. This colder period, lasting several centuries into modern times, is usually known as the Little Ice Age.

Medieval Europe had no system of measuring temperature. Modern scientists estimate temperatures based partly on direct observation of tree rings, lake sediment, arctic ice, and other natural findings. They also observe human behavior, as witnessed in the archeological record and as recorded in accounts. Villages at high or low altitudes were founded or abandoned as the climate changed. Household, **guild,** and **city records** can help track farming trends. Late planting suggests a cold spring; high grain prices suggest poor harvests. Sailors must avoid pack ice, so by reading records of voyages, we can have some sense of which ocean passages were open, indicating warmer temperatures. Some medieval observers recorded the weather they saw, especially if it was extreme.

Around 800, the Norse began sailing farther west toward North America. They sailed through passages south of Greenland that had been closed by pack ice. The ocean surface was warmer, and all arctic ice retreated. Glaciers shrank in Norway, Iceland, and Greenland and in the Alps as well. The Norse not only settled in Iceland and Greenland but also sailed to Labrador in search of timber. Iceland was better able to support farming, and there were two zones of Greenland with growing seasons long enough to raise wheat and hay.

In continental Europe, the temperatures were on average warmer than in past or future centuries. Summers were long and harvests were good. Frost ceased during April, and snow did not fall until December. People began settling on mountain slopes that had previously been too cold. They built villages on the slopes of the Alps, and they reopened prehistoric **copper** mines that had been covered by glaciers. Northern England and Scotland could grow grain in places that now cannot support serious farming, and some farmers in southern England succeeded in growing grapes for wine. Farming spread into valleys and hillsides in Norway that now cannot grow crops. They were able to grow wheat around Trondheim.

Rainfall was higher but not unseasonable, and many rivers were wider and more navigable. **Water** was warm enough for a fish of the Danube River—the carp—to migrate into the colder rivers of Northern Europe. The sea level was higher. Some coastal towns that became important **fishing** ports are now far inland, after the sea level dropped.

Polar ice began to grow during the 13th century, making shipping difficult around Greenland and Iceland. Glaciers in the Alps began to grow again, covering farmland that had been cleared during the warm centuries. In most of Europe, the warm weather and good farming lasted through 1300, when a set of adverse weather conditions began fairly suddenly. There

Europe's peasant farmers had more difficult winters after the 14th century. Forests were already thinning from industrial overuse when peasants found that they needed more wood to keep their houses warm. Their winter clothing was not adequate for colder, snowier seasons. Animals were no longer kept under the same roof as humans, so keeping the animals from freezing now became a problem. The only benefit was an increase in winter sports such as ice skating. (Réunion des Musées Nationaux/Art Resource, NY)

may have been a global or hemispheric cooling trend already beginning, and regional weather patterns may have shifted to an unstable system. High and low air pressure zones over Iceland and the Azores islands became unstable, ocean currents shifted, and a long period of bad weather settled over Europe.

Between 1315 and 1322, most of Europe had too much rain and cold winters. Harvests were flooded, and crops did not grow. There was mass famine and death from starvation. During the 1320s and 1330s, the winters were on average much colder than in the previous century, although the rains moderated and crops grew. In the 15th century, the climate was somewhat warmer, but it did not warm much by 12th-century standards.

Although the average temperatures only shifted by one or two degrees Celsius, the effect on society was dramatic. In many parts of Europe, winter had been a cold, rainy season during the Medieval Warm Period. During the Little Ice Age, it became a time of heavy snow, bitter cold, frostbite, and death. Those who could get enough to eat and keep warm could enjoy winter sports such as sledding and ice skating, since the rivers now froze. The poor died of malnutrition and cold.

Glaciers in the Alps, and in Norway and Iceland, continued to grow into valleys and across roads, reaching their peak sizes around 1700. Periodic famines continued; by the 16th century, thousands of villages and farms had been abandoned. Higher elevations were no longer habitable, and many people had died from famine, plague, or war. Families crowded together, and near towns, for survival. The Little Ice Age tapered off after 1900 as temperatures and sea level rose and glaciers receded.

See also: Agriculture, Fishing, Forests, Records.

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Clocks

In the era before mechanical clocks, time was envisioned as a fraction of the period between sunrise and sunset. Accuracy was not important; it was enough to say that something happened in the first period after sunrise or at the noon hours. Time at night was marked by the setting of stars so people who shared turns keeping watch could divide the time fairly.

Sundial clocks had been used since antiquity, from small sundials attached to walls to large megaliths like Stonehenge. There was no standard way to divide time, and every sundial could follow its own marks. The Romans and **Jews** divided the daylight hours into 12, but the Anglo-Saxons divided the day into four tides. Since daylight periods in the North varied by season, the exact length of an hour also varied. Hours were different at other latitudes. What mattered was not the length of the time period but its position in the day. These variable hours are called temporal hours.

Monasteries marked hours for prayer, with no need for any other times. Sunrise, approximately six in the morning, was called prime in Latin. At about nine, it was three hours later, and so was called tierce. Noon was six hours after sunrise, so it was sixt. At three in the afternoon, it was nine hours after sunrise, or nones. The prayer times multiplied after that until they also included matins at midnight, lauds at dawn, and vespers and compline in the evening. These times were approximate and were marked by the ringing of a **bell.**

Sun and Water Clocks

Parish **churches** in medieval Europe used sundials to mark the times of their services. Each sundial had to be made individually for the place and latitude, and some were very simple. Some are known as scratch clocks because they were literally drawn onto the wall of the church. Each parish priest could mark the hours as he wished, since they only needed to coordinate time in the village, not the outside world. Accurate equal-hours sundials were not invented until the close of the Middle Ages. They required the gnomon of the pointer to match the tilt of the earth's axis, which required calculations of position using an **astrolabe.** The earliest known sundial of this type was made around 1450.

Approximate division of time was not always good enough. The biographer of Anglo-Saxon king Alfred the Great wrote that he invented the first candle-clock around the year 886. The king wanted a clock to help him divide his time between his royal duties and studying so that he would not favor either task. The candles had to be made to a precision size so they would burn exactly three inches per hour. The king kept them in a transparent horn lantern. However, because beeswax was expensive, this system was only fit for a king.

The development of sand hourglasses is unclear in history. The earliest illustration showing an hourglass is in an Italian fresco from the 14th century; their use before this time has often been assumed, but they may have been a new invention in the 13th or 14th century. Two blown-**glass** bulbs were connected by a neck with a diaphragm inside to keep their contents separate. The diaphragm had a carefully calibrated hole to allow the sand

or pulverized eggshell to flow from one bulb to the other. They were set to last one hour and were used in manufacturing processes that needed to be timed, on church pulpits to time one-hour sermons, and at sea, where the pitching of the **ship** did not alter the sand's flow.

Water clocks preceded mechanical clocks. Greek engineers had devised a water clock called the clepsydra that used gears or a pulley to raise a pointer as water flowed into a reservoir. Romans used clepsydra to time speeches in the Senate or in court but did not use them at home or as continual public clocks. Water clocks did not work without being carefully tended. A man had to pour water into them at the right times to keep the inflow reservoir full.

In the Middle Ages, Greek and Roman water-clock technology passed via Constantinople to Arabic scholars. After studying the ancients and writing treatises on hydraulics, Arabic clock makers were able to produce pieces of engineering that astonished Europeans. Caliph Haroun al-Rashid sent a water clock to Charlemagne that used dropping brass balls to trigger its time-telling mechanism. At noon, 12 brass horsemen emerged from windows, like the cuckoos in later mechanical clocks. The same Baghdad engineer made an even grander clock for the caliph and illustrated its workings in a book. It was a true automaton in which falling water drove different moving parts. Sitting on an elephant's back, a mahout, a tall howdah, and a writer sitting in the howdah all moved to keep time. At half-hour marks, an eagle dropped a ball into a dragon's mouth, and the dragon dropped the ball to ring a cymbal while the mahout hit the elephant's head.

In **Muslim** Spain, water-clock technology developed to where some private homes had ornate water clocks. Arabic works on engineering were translated into Latin in the 13th century, at which point the scholars of Europe could learn the details of time-keeping science. Even before this, based on the Roman traditions and their own inventiveness, Europeans had been making less elaborate water clocks.

In medieval Europe, **monasteries** were the chief builders of water clocks because they wanted bells to chime at hours for prayer. They called their clock the *horlogium,* or, later, the horloge. The name meant a timekeeper, not specifically a water clock, so when mechanical clocks came into use, they shared the same name. Monasteries had sundials, too, but only the horlogium could tell time in the dark. It could keep equal hours year-round, even in winter, if the water could be kept from freezing. The horlogium had another advantage because its motion was truly mechanical and could be designed to make sounds, not just a moving shadow. It kept exact hours, rather than temporal hours.

Some may have been room sized and others smaller. A larger water reservoir allowed the clock to run longer without needing to be refilled by a human operator. In a monastery, the horlogium needed to run at least three hours between settings. In 1198, the horlogium saved the precious

relics at the monastery of Bury Saint Edmunds. The bells rang to wake the monks, who discovered the reliquary's table on fire. They used some of the horlogium's reservoir water to douse the flames. Clearly, the monastery's clock contained a fair amount of water in its tanks.

There are only a few existing drawings of these clocks, so modern scholars cannot be sure how they worked. Some may have worked by releasing weights as the water level dropped; the weights could have rolled down to ring bells. Some may have had a wheel with reservoirs that slowly filled and suddenly dumped. Pins attached to the wheel, as to a roulette wheel, would trip bell-ringing mechanisms.

Mechanical Clocks

The first entirely mechanical clocks were not intended to mark hours. They were based on astrolabes and armillary spheres, astronomical models to predict the movements of the planets. Medieval astronomers had a mechanical view of planetary motion, envisioning the planets as fixed on complex combinations of circles. It was appealing to apply new engineering technology to the astronomical model and produce a machine that predicted the rising and setting of stars, the phases of the moon, and other heavenly events. A good astronomical clock of the mid-14th century could use the moon's phases to predict the date of Easter and other movable feasts. Marking off 24 equal hours in a day was an afterthought.

The grandest astronomical clock in medieval Europe was built by Giovanni Dondi of Padua around 1350. His father had also made astronomical clocks, so the craft reached its peak in the family. The clock tracked five planets, the sun, and the moon and was driven by falling weights. There are no records to show when the first clock was built, either for astronomy or for keeping hours, but Dondi's notes refer to the clock's parts as commonly known mechanisms. He seems to have built his masterpiece in a time when simpler clocks were being built, even if few **records** were left concerning these clocks.

In a time when many other records were kept copiously, we know little about when churches or towns installed clocks or who made them. Dates were rarely put on clocks, and those that have dates may indicate repairs or replacement of parts, not the original installation. The first public clock for daily hours may have been the city clock in Paris, built in 1300. King Charles V of France built three public clocks in Paris and ordered the churches to ring their bells when the clocks struck. By 1335, Milan had a clock that struck a bell to ring the hours. Other major Italian cities, such as Florence, Genoa, and Bologna, built clocks in the following decades. Strasbourg, Germany, had a clock by 1354. English priories and churches may have installed clocks beginning around 1280, but by the middle of the 14th cen-

tury, like the rest of medieval Europe, England's churches had mechanical clocks. Barcelona installed a public clock in 1392. By the end of the 14th century, town clocks were a symbol of success and modernity.

The first mechanical clock makers were skilled blacksmiths and locksmiths. Clock making gradually became its own craft, and, by the end of the Middle Ages, it was an established **guild.** Churches and towns also needed clock keepers to tend these **machines** all day, moving weights and adjusting the parts.

A falling weight, usually a large **stone,** was the power supply substituted for water. Weights could also be made of lead, and sometimes they were cast with a pin to hold a pulley for the rope to pass through. One reason clocks were often mounted on towers is that the weight needed a long way to drop before it was wound again. In the earliest clocks, the mechanism was on the ground floor, and the tower's height carried the ropes to a pulley at the top. Later clocks were placed at the top with the weights falling below them.

The clock's mechanism was housed in an **iron** framework, often a large cube. The iron was hand-forged wrought iron hammered out by a smith. Screws and bolts were not invented until around 1500, so the frame was put together with pins tightly driven into holes. A very thick wooden axle, called a barrel, wound a long rope with the weight on the end. Left to fall freely, the weight would unwind the rope, spinning the axle very fast, but

Early mechanical clocks were not designed for anything as dull as telling hourly time. They were complicated astronomical timekeepers that tracked the moon and planets. Astronomical time meant more to medieval people than clock time until late in the 14th century. Even then, astronomical clocks seemed nobler than simple hour clocks. Perhaps this is why the city of Prague chose to go to the great expense of adding one to the city hall as late as 1410, when many other European cities had hour clocks. (Vladimir Babic/ Dreamstime.com)

the weight's motion was slowed and regulated, and the axle moved with steady, deliberate speed. It was the driver for a series of gears and wheels made with precision to turn the axle's rotational speed into timekeeping.

The chief engineering problem that faced clock makers was how to drive a mechanism with falling weights yet keep its motion steadily regulated. The invention of the escapement solved this problem. In purest form, in a pendulum clock, two types of motion interact. A falling weight pulls a circular gear to turn, while a swinging pendulum permits the escapement to twitch left and right. The escapement can either stop the gear from turning or swing away to permit it to turn. The swinging pendulum moves the escapement back and forth, permitting the gear to turn by little jumps as the weight pulls on it.

In the Middle Ages, though, the escapement was not yet driven by a pendulum. Medieval clocks used a mechanism called a verge escapement. At one end of the main drive axle, there was a gear shaped like a crown with saw teeth. It was positioned next to a large pin, called the verge, that had two special features. It had a horizontal crossbar called a foliot that carried weights; it could be made heavier to provide greater resistance to slow the mechanism (or could be made lighter to speed it up). At the point where the crown touched the verge, two pallets met the crown's teeth, stopping the crown wheel from turning. The turning saw teeth pushed each pallet out of the way before catching them again. Since the pallets were turned at nearly right angles to each other, they took turns being caught and pushed, and, as each was engaged by the crown's teeth, the verge turned a bit, then back the other way, then back again. The turning motion of the crown wheel became oscillating motion in the verge and foliot. The crown wheel's turning was stopped and released, repeatedly, which regulated how quickly it could turn. The accuracy of the clock depended on how well the verge and foliot were able to make the crown wheel turn with precise speed.

Clock makers experimented with escapement and striking mechanisms. A foliot bar hung with multiple weights could have its weights moved to different positions to change its balance and drive the clock faster or slower. A locking plate, or count wheel, made the clock strike a different number of bells for each time. It turned slowly, once every 12 hours, and had notches cut in its perimeter. An arm attached to the striking device would allow striking until it fell into a notch. The notches were cut with increasing distance between them to permit the clock to strike more times each hour as the day passed. This was one of the earliest inventions of machine memory.

The first town clocks did not have faces. Because of the monastic tradition of ringing bells for prayer hours and the city watchmen's tradition of ringing a bell at certain times, the medieval concept of a time-keeping device was auditory, not visual. Bell ringing was the entire purpose of the clock. In a **city,** the clock was also a luxury toy that put on a show for the taxpayers.

The clocks drove automata in which mechanical figures played **music** or moved to announce each hour. In many cases, a wooden man-at-arms called a jack moved his arm to strike a bell. Some towns named their clock's jack with names like Jack the Smiter. (The wildflower jack-in-the-pulpit is named for this kind of jack.) Many later medieval clocks had automata that did more than ring bells. In the clock at Wells Cathedral, in England, four **knights** tilted at the joust, and one was unhorsed. In the Strasbourg Cathedral clock, the 12 disciples circled around Jesus.

Clocks became regulators for commercial time, not church time. Town watchmen used the clock to know when to cry the hours or ring bells. Notaries began to write down the time of day when a document was created, not just the date. Towns set curfews and regulated working hours for certain noisy crafts by clock time. Courts and assemblies set meetings by clock time, which permitted them to set time limits and fines for tardiness. As commerce got used to regulating meetings and other activities with precision, wealthy men wanted clocks at home. It was not enough for a clock to drive a set of bells to ring hours for prayer. People needed to see time and have access to timekeeping at home.

The concept of a visual clock face came at the end of the Middle Ages. The astrolabe's face, divided into the hours and minutes of a 360-degree circle, became the model for the development of a clock face. The astrolabe had a movable hand, the calculer, that worked as a pointer. In the 14th and 15th centuries, some clock makers adapted the astrolabe's face and pointer to the calculation of time. Mechanized and adapted, it became the clock face. Town and church clocks had dials installed after 1400.

At the very end of the Middle Ages, some new clocks were driven by coiled springs. The earliest manufacturing record of spring-driven clocks is in Burgundy around 1430, and there is one existing clock from around 1450 in the Victoria and Albert Museum in London. The spring was coiled inside a drum, and it was wound up and then unwound slowly. Although the spring was more convenient than weights, it was harder to regulate. A spring's force is always greatest at first, and then peters out, unlike gravity's steady pull on a weight. One simple solution was to set the spring's force to unwind a string from a spindle and to shape the spindle like a flared cone or a trumpet's bell. This spindle was called a fusée, and it was the main drive axle of the clock. Its unconventional shape provided more resistance when the spring's force was greatest, but, when the spring's power was running down, it unwound string more easily. This balance kept the clock's motion steady.

Early spring-driven clocks are large instruments that stood on the floor or sat on a table. An iron or brass frame held the moving parts and stood on legs. The frame was always ornate because the clock was a very expensive luxury item. After a medieval craftsman had put so much effort into the

precise handmade gears, he did not consider his work complete until its case was decorated as though it were a tiny Gothic **cathedral.**

See also: Astrolabe, Bells, Machines, Monasteries.

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Cloth

The basis of all cloth making is the creation of thread, from which cloth is woven. All materials—cotton, linen, wool, and silk—require the natural fibers to be twisted into a uniform thread. The most common thread in Europe's Middle Ages was of wool, and it was most easily spun by hand with a distaff. Flax, the second most common material, could also be spun easily by hand. All **women,** rich and poor, spun, and, in order to produce the volumes of thread required to clothe a household, they spun nearly all the time. Medieval images of women show them holding spinning materials while traveling, feeding **animals,** and cooking. Many also wove, but weaving and other stages of cloth production were increasingly part of a skilled profession.

After the year 1000, some areas became centers of cloth manufacture. Flanders had climate conditions that were good for growing dye plants, and its soil had the right kind of soil for fulling, a cloth-finishing process. It was close to England, which exported large amounts of wool. The weaving industry of Flanders became one of the hubs of European trade; silk merchants traveled from the Mediterranean to trade for Flemish woolen cloth woven from English wool. During the early 14th century, the English induced some Flemish weavers to move during a period of political instability in Flanders. By the close of the Middle Ages, England was also a wool-weaving powerhouse. Italy produced most silk, and it also wove the newest

textile fiber—imported cotton from Egypt and India. There were also novelty fabrics: nets, felt, and ribbons.

Four Fibers: Wool, Flax, Silk, and Cotton

Wool was medieval England's chief export, and large flocks of sheep were also grazed across France. **Monasteries** kept the largest flocks of sheep; they used the sale of wool to fund their communities. Cistercian monasteries were especially methodical in their sheep breeding and shearing. They graded it by quality and sold it in bales.

The best wool came from Merino sheep imported from Spain, the worst from more primitive double-coated sheep. On each sheep, the fleece's quality varied. Fleece from the sheep's shoulders was the best, while belly fleece was not usable. Sheep breeders kept mostly white sheep but often kept some black or dark brown sheep in the flock for color variation. These alternative colors could be woven into stripes or spun into a blended shade.

Wool was first washed and then combed or carded to remove brambles and lengthen the fibers. In the early Middle Ages, wool was combed with a pair of wool combs that had a few rows of bone or metal teeth. They were usually heated and dipped in fat, and then one was placed on a post. The

Especially in a large, wealthy household, the women and girls were constantly working to produce thread. Here, the young girl on the right is combing wool to clean it. The cleaned wool goes next to the girl in the center, who is carding it to make the fibers lie smooth. Her carded wool is rolled and given to the spinner on the left. She ties the rolled wool onto the distaff, which she holds under her arm. Her hands are free to draw and twist the wool into thread. The spindle at her side is a spinning weight for tension and twist. The aristocratic lady who presides may be embroidering. (George Unwin, *Gilds and Companies of London,* 1908)

other comb was held. A mass of wool was put onto the stationary comb, and the other comb drew the wool fibers from it. The wool was repeatedly combed until its fibers were as long as possible and ready to be spun. Carding was introduced to the wool industry as a solution for how to use wool with short fibers. The card was a board covered with leather and densely packed with small **iron** hooks. Like combs, cards worked in pairs and had to be oiled. Short-fiber wool was repeatedly raked between them.

Wool was the all-purpose European textile fiber. It was the chief fabric used for all outer **clothing** and blankets. It was the yarn woven into **tapestries,** and it was often the thread used in **embroidery.** It could be tightly fulled and made windproof or left unfulled so it would be finer and more flexible for a lady's dress. It was woven thickly to make blankets and woven thinner to make hose. It was rarely washed, if ever.

Flax was the earliest plant used to make textiles. It is a field plant that bears small blue flowers, and it grew in nearly every European climate, so its production and use were universal. The stem of the flax plant, soaked until it rots, separates into many fine fibers that run the length of the stem, from root to tip. It must be soaked for about two weeks to begin rotting (a process called retting) and then dried, beaten, and scratched to remove the fibers from the rotted bark. In the 14th century, a new technique for handling flax improved linen production. This was the flax breaker, a simple hinged set of boards that bent and beat the flax fibers. It processed them faster than pounding with hammers, and it could be mechanized with a water **mill.** The flax fibers were separated into short ones that made tow, which was coarse and cheap, and long fibers, which were spun into real linen. Flax fibers were not elastic like wool, and they were harder to spin and weave.

Linen was used for sheets, towels, shirts, and undergarments. It was usually bleached or left its natural color because linen did not take dyes as readily as wool. It held up through repeated washings, so it was used for garments most likely to be boiled, soaped, or beaten. When flax was woven into towels, the type of weave chosen left some floating weft threads that made the cloth more absorbent. The modern word *diaper* for an absorbent cloth used with **babies** first applied to cloth woven in a repeating pattern of goose-eye diamonds that left these floating threads. In the Middle Ages, *diaper* meant a repeating pattern and could describe the background of a shield or the design on a **castle** wall.

Silk came from China, where the secrets of raising silkworms on mulberry trees and weaving their delicate threads were closely guarded. Drawlooms were making patterned silk brocades in China while Europeans were still weaving on simple vertical looms. Silkworms were also native to India, and they spread from there to the Arab countries. **Muslim** rules against pride at first discouraged the use of silk, but a major silk-weaving industry grew in Persia. Chinese and Persian silks were patterned with designs that

looked very foreign to Europeans, whose royalty treasured them for **funeral** shrouds and robes. Saint Cuthbert, an Anglo-Saxon monk of the seventh century, was buried in a shroud of imported silk.

The trading route from the Mediterranean Sea to China was known as the Silk Road because silk was its primary import, and all silk came from the East. Even when the Byzantine Empire set up silk-weaving centers in Alexandria and Constantinople, the silk itself had to be imported. Legend says that two monks smuggled some silkworms to Constantinople during the sixth century. By the ninth century, Byzantine silk weavers had their own supply of raw silk. Access to the expensive purple dye made from mollusks in Lebanon meant they could produce the most expensive silks of all.

Constantinople guarded the secret of the silkworms as China had done. However, gradually the technology spread from Persia. It came first to Arab-ruled Sicily and Spain, which established mulberry orchards and by the 10th century were producing raw silk. Spanish silk was perfected in the Almeria region; by the later Middle Ages, its weavers made *lampas* and damask with geometric designs. From Sicily, **Jewish** silk weavers brought the technology to the Italian city of Lucca, which developed the industry to a new level. Like silk-weaving centers before them, the Lucchese made it a capital offense for silk workers to leave the city, but the city was sacked by Pisa in 1314, and silk workers fled to Florence and Venice. Silk-weaving technology did not reach Northern Europe until the late Middle Ages, but then towns like Arras and Beaumont became centers of silk weaving using raw silk imported from the Mediterranean region.

Silk mills used waterpower to spin the silk threads together into stronger strands for weaving. Waterpower was used for silk, but not for wool, because human labor for wool was still cheaper and because the speed and power of water was not needed to spin wool as it was to spin silk.

New fabrics came from the silk industry. Brocade was a fine silk fabric with dense, complex patterns woven onto it with a separate shuttle and often in another color; invented in China, the technique spread through Persia and into Europe. Satin was a very dense, thick silk, also developed in China; damask was a heavily patterned silk fabric first made in Damascus. Damask weaving required well-developed drawloom technology to produce complicated repeating pictures of **heraldic** designs, animals, and flowers. Damasks produced in Italy, and sold all over Europe, combined artistic influences of China, Arabia, and Europe. A typical damask might have peacocks, lions, monkeys, or faux-Arabic letters.

Extremely lightweight silk crepe came from the East during the **Crusader** era and was used to make fancy, lightweight pleated dresses for noblewomen. Later, silk crepe, often with a border stripe, formed the floating veils of 14th- and 15th-century headdresses. Shot silk was woven in two colors; from Baghdad came baudekyn, a shot silk with threads of **gold.**

Velvet was invented in Lucca, Italy; it was woven by creating fine loops sticking up from the fabric. The thread was looped over thin rods, and the loops were then cut to create a soft fur-like effect. During the 14th century, velvet became a more common, though still expensive, fabric. Some cheaper velvets had linen threads mixed into the ground weaving. As velvets improved, some were trimmed with patterns cut into the velvet, and others had gold threads mixed in. Pure silk velvet remained one of the most aristocratic fabrics.

Northern Europeans were importing silk thread long before they learned how to weave it. Silk was used in embroidery and in ribbon weaving; ribbons were used for decoration and for finishing the edges of garments.

Cotton, a plant that bears soft fibers suitable for spinning and weaving, was native to India. It spread into the Arab lands during the eighth century, and it was introduced to Muslim Spain around the ninth century. Its first use in Europe was simply as padding in quilted linen or wool. Quilts were not made as bed covers; they were used as winter clothing and as padding under **armor** for both men and **horses.**

Italian manufacturers first imported raw cotton from India and Egypt and then began to grow cotton as well. The Po River Valley area of Northern Italy became the cotton-manufacturing powerhouse of Europe. Because Italian cotton was mostly exported, it developed a more regulated, industrialized system than Northern Europe's home-worker system. A mechanized spinning wheel made better cotton thread, so its use caught on quickly and improved output. Italy's cotton mills produced simple, uniform cotton cloth for mass market, not luxury printed or patterned cotton. It was used for the same things as linen and was easier to care for.

The 12th-century doublet, introduced in Italy, was made of cotton, and its manufacture and fashion depended on the cotton industry. It was first an undergarment and later was worn outside. The doublet became a fashion statement of tight fit and bright colors. Other late medieval **hats** and **clothing accessories,** such as veils, wimples, handkerchiefs, and linings, were dependent on the supply of cotton.

Spinning, Weaving, Dyeing, and Fulling

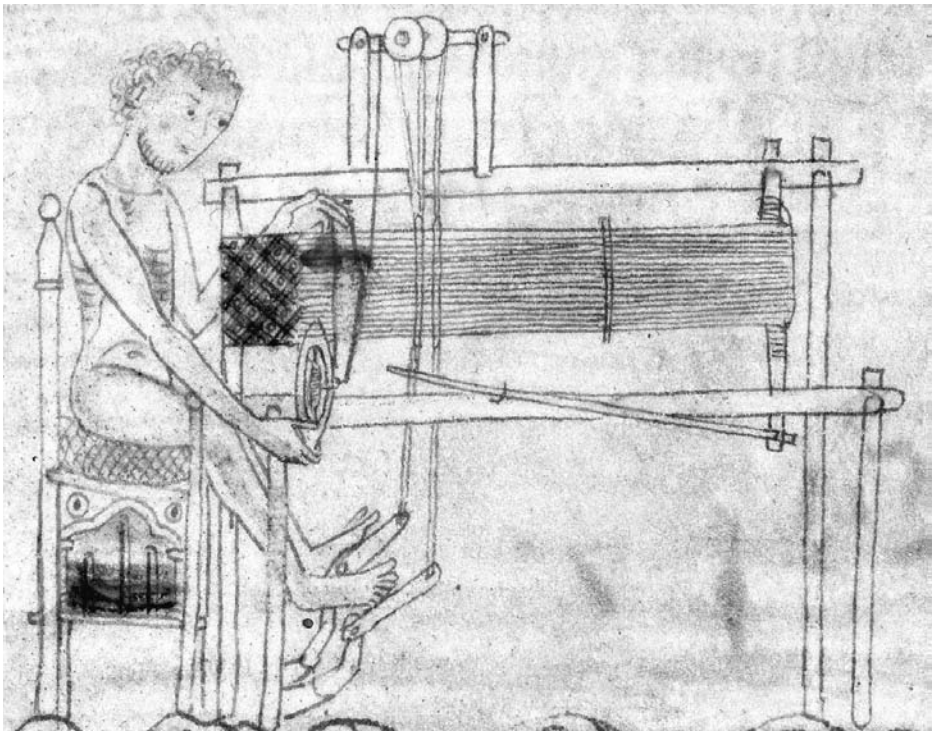
Most medieval wool and flax were spun with a drop spindle. The raw fibers were tied onto a staff, called a distaff, that held them above the spinner's head. As the spinner began to pull and twist a thread, she tied a weighted spindle onto it. This spindle helped draw down more wool or flax as it spun, and it wound the thread as the spinner twisted it and controlled its thickness. Spinning one direction made it suitable for warp and the other for weft. Nearly every medieval European woman carried a distaff and spindle with her everywhere she went. Spinning remained a home craft long after the Middle Ages ended.

The spinning wheel came to Europe in the late 13th century. In the earliest European form, the spinning wheel had a large wheel that ran a smaller spindle to wind the spun thread, which was controlled by hand as the spinner fed wool toward the spindle. The quality was much lower; wheel-spun thread was not as even, and unsightly thick spots alternated with thin, easily broken stretches. Because it was faster, wheel spinning spread in spite of weaving **guild** bans against it. Wheel-spun thread was used as weft, which did not need to be as strong as the tightly stretched warp.

All weaving consists of a row of long threads that are held tightly and a loose thread that is passed back and forth, going over and under each thread by turns. The tightly held long threads are called warp, and they must be very strong. In the simplest weaving, they are all the same color, perhaps white. They can also be patterned in stripes. The loose thread that is passed back and forth is called weft and is usually what creates most patterning. It can be wound onto a stick or a bobbin. It is simple for a weaver to change colors by alternating different weft threads. Plaid is created with both a striped warp and a regular change of color in the weft. The simplest weaving pattern is called tabby weave; it is the over-and-under weave children can imitate with paper, the weave still used for household sheets.

Early looms were vertical. They could only be as high as a weaver's head and as wide as a weaver's arms. The warp was made up of hanging strings held at the bottom by doughnut-shaped weights, and the weaver used a heddle stick to lift the warp threads. The heddle stick had strings (heddles) that were attached to alternating warp threads. These threads were allowed to hang straight down with their weights behind the loom, which was tipped toward the wall. Those not in heddles were held forward by another rod. As the heddle stick raised the back threads to the front, or permitted them to hang straight at the back, two alternate sheds were created. The weft, held on a shuttle, was passed through the sheds to create the fabric. In Scandinavia, weavers tended to begin at the top and weave down, while in central Europe, they began at the bottom and wove upward, tucking the weft threads tight with a comb. As the vertical loom was improved, its beams were designed to wind the finished cloth and expose more warp for weaving.

Horizontal counter-balance looms were introduced in the 12th century. After they caught on, vertical looms remained in use only for tapestry and in Scandinavia, where the customs were more conservative and textiles were not exported. The new looms were as wide as a weaver could reach and twice as long. The frame of the counter-balance loom was tall, with beams above the weaver. Two foot pedals operated racks of heddles that moved up and down, as in a modern loom, using a harness with pulleys above the loom. Wooden boat shuttles with iron bobbins moved the weft smoothly through the shed. The weft was packed against the finished cloth not with a pick or comb, but with a large comb called a reed, which ran the width of the loom



When looms were designed to be horizontal, weaving turned from a simple home craft into a technological profession. While vertical looms required the weaver to adjust a heddle stick with her hands, the treadle loom allowed the weaver (now often a man) to change sheds with his feet. Weaving was twice as fast this way. The 12th-century loom shown here has only two harnesses for the foot pedals to lift, but soon there were four-harness looms. By the close of the Middle Ages, professional weavers invested in eight-harness looms and drawlooms. (Trinity College, Cambridge, UK/The Bridgeman Art Library International)

and hung from the frame. The weaver could get a rhythm going with foot pedals to change the shed, one hand to throw the shuttle through the shed, and the other hand to swing the reed to pack the new thread into the cloth as the feet changed the shed again.

On a horizontal loom, the warp was held tight by being wound around a beam at the front and another beam at the back, both of which could turn. A long peg went through the end of each beam so it could be lashed tightly against the loom's frame to hold the warp taut. Much longer warps could be dressed on the looms, since the tautness now came from the way the beam was wound, not from hanging weights. As the fabric was finished, the front beam rolled it up and the back beam unrolled more warp.

The horizontal loom also allowed for more complex warp patterns. More heddle frames could be added, with more foot pedals. Each frame could

carry one warp thread in four or some other pattern. The weaver could create twills and diamonds.

More loom improvements came with time. In the 13th century, they made wider looms operated by two weavers who threw the shuttle to each other. By the late 14th century, a very complex loom called a drawloom could make intricately patterned fabric. It had been invented in either China or Syria, and it was used there for silk. Its introduction to Europe did not come until the late Middle Ages, and it was confined to the cities of Spain and Italy, where trade with the Arab and Byzantine lands had been greatest. In addition to its heddle frames, the drawloom had a vertical set of strings that could lift individual warp threads. They ran up to a frame of pulleys above the loom and had to be worked by an apprentice. As the weaver wove with heddle frames and shuttles, the boy pulled on groups of strings in a set pattern to further complicate the sheds. The drawloom could make shields, fleur-de-lis, and animal images. Other specialized industrial looms made velvet and damask.

Dyeing was a skilled profession separate from weaving. Each step of cloth finishing had its own guild of craftsmen. Dyers needed to use both dyes and mordants, which fixed the colors so they would not wash out. The cloth was soaked in a mixture of plant dyes and a mordant, usually alum, and then laid flat to dry. With many wool yarns, the dyeing took place before weaving; skeins of spun thread were dyed and then allowed to dry hanging up.

Three native European plants provided the primary colors to dye most medieval fabrics: woad for blue, madder for red, and weld for yellow. Weld, woad, and madder are the dyes used to create most tapestry colors. Weld with woad created green dye, and weld with madder made orange. Blended all together, they could make brown, even a brown so dark it could pass for black. Most medieval woolen clothing was dyed using only these three natural dyes.

Woad destroyed the soil it grew in, but many farmers in Germany, Lombardy, Picardy, and Flanders grew it anyway. They pulped the leaves and pressed them into balls, and in that form they were sold wholesale. Dyers ground and fermented the woad to make it into ready dye.

More expensive red dye came from Spain and Portugal. An insect that lives on the kermes oak can be collected with its eggs, and the eggs are sieved in vinegar. This red dye was brighter and more expensive in far-off countries like England, where it only became a standard import in the 12th century. Jewish traders were primarily responsible for importing kermes dye.

Lichens collected from places as distant as Norway and the Canary Islands provided most purple dye. The dye was not lightfast, and later wool dyers used blue and kermes red for a more successful deep violet.

Imported dyes were mostly used in the large cloth productions of Italy, where imported materials were cheapest. The luxury dyes of Florence's

Arte di Calimala guild came from dried insects (kermes), a lichen called orchil, and an East Indian tree called brazilwood. From these, they made red and violet, as well as other bright, strong, dark colors. Scarlet cloth was extremely expensive, so it was only worn by princes of the church and state.

Dyeing traditions changed during the late Middle Ages. White had been the color of mourning until the 14th century in the Mediterranean countries, but black became the new custom. Dyeing mills switched to dark colors. The indigo blue of India was a brighter, stronger blue dye, but it was not at first used outside painting because it did not dissolve into dye vats. Using notes from Marco Polo, the dyers of Venice learned how to dissolve it.

Fulling was the last process and another distinct craftsmen's guild. It is a process of treating the wool to make it into a stronger, thicker cloth. Not all woven wools were fulled; fine worsteds were left alone. For hard daily use, though, fulling made a denser fabric that was nearly windproof and waterproof. The resulting fabric was often called broadcloth, and it was an all-purpose clothing material.

Fullers put the newly woven cloth into a trough filled with water, fuller's earth, lime, sand, and either urine or wine. In earliest times, they trampled the cloth in this mixture with their feet. As water mills became more common, some fullers set up mills so hammers could pound the cloth. The agitation made the wool shrink to about a third of its original size. Then the cloth was rinsed and stretched tightly on a tenterframe to dry. The tenterframe was a rectangular wooden frame with iron tenterhooks evenly spaced

Dyeing was one of the last steps of cloth manufacture. Here, a dye worker is stirring either skeins of thread or woven cloth immersed in the hot dye vat. The color red, easily and cheaply made from the native plant madder, never lost its popularity for clothing and decoration. (Jupiterimages)

around it. The cloth was often softened with teasles that raised the fibers to create a nap, which might then be trimmed with large shearing.

In the 1200s, the cloth business model passed the same fibers through many hands before they came to market. Cloth merchants initially purchased raw wool and sold it temporarily to home workers, who carded and spun it and sometimes wove it as a family business. The weavers sold the cloth back to the merchants, who sold it to dyers and fullers, repurchasing it each time. The cloth was then sold at a fair or market. The cloth merchant protected his investment by selling it at each stage so he could opt out of buying it back if the quality was poor or the market was down.

Novelty Cloth

Knitting was not widely used, but it was known by the late Middle Ages. A single-needle technique called *naalebinding* was its precursor and had been used for socks in the Scandinavian countries. Knitting on two needles was faster. It was probably used to make some close-fitting caps; a few such caps dating to the 14th and 15th centuries have been found in France and Germany. Knitting was also used for gloves in England and on the continent. It was not used for larger garments.

Felt is a nonwoven material used to make hats, boots, rugs, and objects like knife sheaths. The fibers of wool are covered with microscopic hooks. Water, heat, pressure, and friction cause the hooks to entangle with each other, shrink, and become impossible to separate. Wool felt can be cut with scissors and will not fray like unfulled woven cloth. By the 14th century, some hat styles were made of wool felt, and the 15th century's fashion of tall hats for men depended on the stiffness of felt. Some hats were made of beaver fur combined with wool; Chaucer mentions a beaver hat in *The Canterbury Tales.*

Famous holy men were known for wearing hair shirts made from an abrasive fabric. This fabric was probably woven from goat hair. Goat hair cloth may also have been favored for some shrouds to wrap the dead. It had the suggestion of penitence and humility. In goat-breeding regions, better goat fibers probably were used for blankets and cloaks.

Tablet weaving was a simple home craft that made decorative bands and belts. A woman could carry a tablet weaving kit tied to her belt and work on it whenever she had spare time. A set of wooden tablets with holes in them was worked into the narrow warp; as the woman turned them, they lifted various threads to make a pattern. Other small looms made tabby-weave ribbons.

Tablet weaving was a craft considered noble enough for queens and noblewomen to work on, like embroidery. They worked with the most expensive silk threads and created brocade ribbons that they used to decorate

shawls or wore as girdles. Convents put even more effort into tablet weaving, and some women did it for income.

Tablet weaving and braiding both contributed to making silk strings for rosary beads. One complex braiding pattern was created by using five or more strings attached to a fixed point, which ended in loops for the fingers to hook through and manipulate. Other kinds of plaiting, using up to eight strands, made wide decorative strips.

The technique for making knotted fishing nets was applied to silk thread to make hairnets. Hairnets begin to show up in the pictorial record during the 13th century, and over time they became more elaborate, with embedded jewels. Netting required long needles with an open eye at each end that were wound with thread-like shuttles. The netter looped thread over a foundation rod and, using a small silver rod to keep the hole sizes even, passed the needle in and out of loops to create a network of knots.

See also: Clothing, Clothing Accessories, Embroidery, Fairs, Hats, Tapestry.

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Clothing

What we know about medieval clothing comes mainly from **paintings** and **sculptures** made during each period. There are occasional written **records,** such as a sermon preached against immoral clothing and an inventory of

possessions for a will. When medieval artists painted scenes from the Bible, they showed the figures wearing clothing from their own time, not from the historical period. These paintings can help us date with accuracy the development of different articles of clothing. Very little clothing has survived from medieval times. Most **cloth** was recycled into other clothing or household articles, and finally it often became rags or material for **paper.**

Although clothing changed from century to century, the sharpest differences were not across time but between rich and poor. The poorest people wore undyed cloth that was the natural sheep's gray. They could afford only a small amount of fabric, so their robes and tunics were short. Clothing was rarely new; clothing was left to survivors in people's wills, and there was a market for used clothing. Poor people wore outdated fashions that were stitched and patched. In the later Middle Ages, paupers often wore black because they had received a new robe to wear in a **funeral** procession. Their robes might be in better condition than their neighbors', but the robes were made in a color and style that proclaimed the wearers to be charity cases.

Clothes for the wealthy used more fabric, so their tunics, robes, and gowns were always longer, fuller, and more heavily layered. They used the fabrics that were newly available, which meant silk in the early Middle Ages and cotton or silk velvet in the later Middle Ages. Their garments were heavily decorated with time-consuming methods like **embroidery.** The poor could not even find the time or colored thread to create simple decorations, but the rich had money to pay craftsmen to spend hours applying **gold** or **silver** thread. The rich used fur linings as another important marker of status and wealth. Some furs, such as ermine or vair, could only be worn by royalty and the top aristocracy.

The gap between rich and poor was not accidental; it was an openly known class privilege the aristocracy clung to even when rising prosperity allowed common people to afford nicer things. In the 12th and 13th centuries, kings (and even **city** governments) made sumptuary laws that dictated what and how many pieces of clothing could be worn by nonaristocrats. Commoners were forbidden to wear certain types of robes or certain colors. They could not wear exotic fur such as miniver. **Servants** could not wear silk. Fashion became very consciously a separator of the classes, a way of knowing at a glance where a person fit in the social scale.

It was not easy to police the strict observance of sumptuary laws. The official tasked with charging fines found himself sitting in a public place, pulling men and **women** aside to examine their dress. If he could ascertain that they were not of the right class by taking their names, he could fine them. However, many people were clever and found ways of claiming that the buttons, furs, or other luxuries they indulged in were really something else. Some women refused to give their names, and judges grew frustrated with having to police such trivial matters.

The growing middle class dressed halfway between rich and poor. They could not alter their styles as rapidly as the late medieval court, but they could find compromise styles that resembled the trends. They wore good fabric in bright colors and used homemade embroidery and inexpensive **jewelry** to dress up their garments. In prosperous times, they challenged the class barriers and sumptuary laws with furs and silk. In all times, they were careful to keep their clothing clean and in good repair.

In modern times, with clothing made cheaply in developing countries, people own more garments than they can wear in a week's time. In the past, every thread of a garment was time consuming and valuable. Common people owned two or three changes of clothing. The poor owned no more than they wore, and to keep warm they had to wear everything they owned. Every clothing purchase was a major investment. Nobody wanted to throw away clothes. During times of **plague,** clothing should have been destroyed, but people took clothing off the dead even if it spread the infection.

Clothing design took into account how much fabric was available. The clothing that has survived is often made of multiple pieces of fabric, perhaps because this method allowed scraps to be used. In Northern Europe, wool was the most available fabric, linen second. Inner garments were usually linen, and linen provided the main sewing thread. Outer garments were wool. Even among the wealthy, silk—including silk thread—was reserved for what would show. Inner seams used linen, and visible outer stitching used silk.

Without good fasteners, clothing had to be large enough to fit over the head or hands while not taking up more cloth than necessary. Early medieval clothing always had neck holes large enough to fit over the head that were closed tighter with a hook, pin, lace, or drawstring. Buttons were not invented until the 14th century. After buttons were invented, sleeves and bodices could be made to fit tightly, using less fabric but many small buttons.

Until the 14th century, women always wore head coverings, from light veils to full hats. Men, too, wore **hats,** hoods, and coifs. Hats were worn indoors, not just outside, and were usually made of linen. Members of the upper class of both sexes wore gloves and had a variety of pins, brooches, hairbands, and girdles that were often very decorative. Stockings or hose and **shoes** or boots completed their dress. Stockings went above the knee for men and were attached to an inner belt. They were shorter for women and were held up by garters at the knee or thigh. Children's clothing was always a simpler version of the adults' clothing of the time.

Those with linen undergarments were expected to change them every two weeks, rather than daily. Linen undergarments were washed, like household linens. Other linen garments, like shirts and tunics, could also be washed. In cities, the washing was done by professional laundresses who

used lye-based soap, boiling water, and a convenient riverbank with either bushes or clotheslines. Wool garments, however, were almost never washed. They were shaken, beaten, brushed, and aired in the sunshine to kill moths. Spot cleaning could be done with urine, fuller's earth, or lye.

Styles in the 7th through 10th Centuries

Clothing in Europe was a blend of two earlier traditions, Roman and barbarian (which meant anything not Roman). Romans had worn simple, flowing tunics and cloaks made of single rectangles, either fastened at the shoulders or draped around the body. Toward the end of the empire, a basic *T*-shaped garment, the dalmatica, came into fashion. This was a long-sleeved robe cut from one piece of fabric; the arms were rectangles, and the body was a rectangle with a neck slit that was folded over at the top. Seams stitched the sides and underarms. By the seventh and eighth centuries, this *T* shape had been refined into shapes more recognizable to us, with narrower arms, narrower waists, and flared skirts. The barbarian tradition generally featured trousers. Persians, Goths, Franks, and other invading tribes wore simple trousers, square cut and tied with a drawstring. Some styles became more refined and fitted closer to the legs. Very narrow breeches developed into hose.

The early medieval period inherited hose, breeches, long-sleeved robes, and cloaks. As a general principle, poor men who needed to work used practical clothes, such as short tunics and breeches. Anglo-Saxon and Frankish peasants wore simple breeches, also called braies, that are recognizable to modern eyes as very simple trousers. They were loose and often came only to the knee, where they might be tied. These breeches were clearly the most practical for outdoor work, as they left the legs more free for movement than even a short tunic. Because they were so practical for work, aristocrats did not wear them.

Wealthy men wore clothes designed to show their impracticality and ability to afford yards and yards of fine cloth, so they tended to prefer long robes and ample cloaks. Even the nobility of the Franks, a trousers-wearing tribe, stopped wearing pants and adopted the robes of Roman and Byzantine fashions.

During this early period, Constantinople was the height of luxury and fashion. The clothing of Byzantine nobles was heavily decorated with embroidery and pearls. When less cultured people came to Constantinople and saw the jewelry, robes, and hairstyles, they took the ideas home and found ways to imitate them to a lesser degree. Byzantine royal dress influenced the way Charlemagne styled himself, which influenced the Frankish nobility for years to come. Long robes made of fine fabrics became the mark of nobility.

The poor in any time dressed simply and their fashions did not change as quickly. Their clothing was practical, plain, and more sparing of cloth yardage. Tunics rarely reached below the knee, and sleeves were no wider than they had to be. Garments were mended, turned, and remade when they finally wore out. Instead of wearing expensive hose, peasants often bound their legs with rags. They preferred to wear bright colors, since dyes did not add much expense. Only the true paupers wore black and gray. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

Style in the 11th and 12th Centuries

The centuries that established England's Norman kingdom and launched the **Crusades** were the beginning of fashion in Europe. Clothing had been traditional and practical before this, and fashions had changed very slowly—clothing a century old did not appear odd. During the 12th century, fashion began to change every decade or so among the upper classes.

At court, dress for both men and women was embroidered and decorated with tassels, feathers, and pearls. Everyone who could afford it, from the king to a craftsman, lined his robe or cloak with fur for winter. Imported silk now included not only single-color but also patterned silk. Imported silk brocades and damasks are shown in paintings of queens' rich robes. In general, clothing tended to be made of many ample layers of cloth cut in simple patterns.

The basic garment for a man was a tunic, a long-sleeved dress that came to the knees. It was called a cote or cotte when it came to the knees and a robe when it fell to the floor. Poorer men wore shorter cotes because they could afford less fabric and because it allowed their legs more freedom to

move. Aristocratic men wore short cotes when they needed to ride, but, on state occasions, they wore longer robes because it showed their status. Long robes cost more, and they suggested the wearer did not need to walk anywhere unless he wanted to. The cote or robe was always belted with a girdle (belt). For most of this period, a man's girdle buckled tightly around his waist so his tunic created folds above and below it.

A garment worn over this basic cote or robe was the surcote, or overcoat. Nobles wore combinations of these garments with the changing fashions. Around the mid-1100s, some nobles had garments with dagges cut in them; these were like large fringe in which the fabric had been cut and hemmed so fingers or leaves of cloth hung from the edges of sleeves or at the bottom of the surcote. Since their surcotes were usually made of fulled woolen cloth, the fabric did not fray.

Only nobles were permitted to wear a mantle, which was a large draped cloak. The mantle was fastened by a chain, strap, hook, or button, either in front or at the shoulder. It was not easy to manage, since it tended to fall off or get in the way, so wearing it well was a mark of high culture. Mantles might be fur lined, embroidered, or adorned with jewels. Kings customarily gave the mantle they were wearing to a **minstrel** whose skill pleased them very much or to a messenger who brought extremely good news. (The recipient was not permitted to wear it, but he could keep or sell it.)

Men's legs below the knee were often covered with the forerunner of socks. These tubes of fabric (possibly knitted) did not have a foot shape on the end. They needed garters to hold them at the knee. It was practical to cover the leg between knee and ankle to protect the skin from brambles. The poorest men wrapped strips of cloth, or even straps of braided straw, around their legs.

During the 12th century, men began wearing hose. Hose was not knitted, but the fabric was cut on the bias so it had some flex. Hose were narrow leggings that were not connected to each other. Each leg was put on separately and came to the top of the thigh. Since the cloth was already cut on the bias, the diagonal continued past the top of the thigh up to the hip. At the hip, there was a loop for a belt to pass through. This was how the hose stayed up. Some hose had full feet, and some did not. Some hose had a stirrup strap under the foot but no heel or toe.

Women wore long robes, always to the feet. Aristocratic women's robes were longer than the floor, and, in some fashions, the gowns formed trains at the back. Women lifted their skirt when they walked, showing a shorter underskirt that only came to the ankle. Fashions during this period changed, although much more slowly than modern fashions do. In the 11th century, a woman's robe was often laced at the back to show her figure. She usually wore a girdle, and, if she was wealthy, the girdle displayed silk, gold, or embroidery. For most of this period, the girdle was wrapped tightly around

the waist; toward the end of the period, the girdle draped loosely, and its fastening hung down a woman's abdomen in a *V* shape.

Women of the 12th century also wore a corset made of leather, stiffened with wood or bone, that laced up the front. Their robes were laced close to the body to show their figures. An inner tunic, usually white, was called a camise or chemise in French, or smock in English. A noble lady might wear a corset next to her skin, and then a sleeveless white linen chemise; a colored, long-sleeved underdress of lightweight wool; and last a heavy, decorated robe with long, full sleeves over all, with a full skirt ending in a train.

Following the First Crusade, some new fashions came to France and England. A new kind of robe, the bliaut, was made of very light silk fabric. It was wide and flowing in its skirt and sleeves but stitched and ironed into pleats at the top to make it fit well. Over it, ladies wore a tight vest called a corsage or a wide belt of fabric laced at the back. The effect was brightly colored, highly decorated, graceful, and exotic. A new kind of surcote arrived, too—the Persian coat. It was a loose overrobe with wide sleeves, and it fastened with only one clasp at the waist. Instead of being part of an outfit, it could be put on when the room grew chilly. Its name in French, *peliçon,* became the English word *pelisse,* later used for any women's coat put on this way.

Style in the 13th, 14th, and 15th Centuries

The fashions for both men and women in the 13th century were conservative compared to the centuries that followed. In general, they paired an inner tunic or gown with tight long sleeves with a surcote. Surcotes could be lined with fur and worn in cold weather. They were made with or without hoods or sleeves. All were brightly colored and heavily decorated.

One man's form of the surcote was a gardcorp, a hoodless coat with long, full sleeves that were gathered or smocked at the shoulder. This type of sleeve usually had a slit to allow the wearer to put his arms out and let the heavy sleeves hang down. Wearing his heavy sleeves empty would give his arms better dexterity, and it would be cooler. The sleeves were large enough to cover arms and hands, too, when they were worn in full form. Men who worked, such as merchants and physicians, favored practical designs like this, but such surcotes also were worn by the nobility.

A popular 13th-century form of surcote, for both men and women, was the cyclas, which was often open at the sides. The cyclas was made of very rich fabric; its cut was simple, but the decorative fabric showed off the wearer's rank. Paintings suggest the cyclas could be made from imported silk brocade and damask and heavily embroidered silk. Among women the cyclas developed into a sideless dress. The sideless gown was lightly attached, front to back, at the hips and shoulders, but otherwise it was entirely

open. When women wore the cyclas or the sideless gown, they took care to raise it as they walked because they wanted to show the quality of the gown under it. It was considered graceful and refined to hold one's skirt up a few inches.

There was a new fashion for cutting the edges of a garment to fancy shapes, called cointise or quintise. *Quinteuse* in French meant "fanciful." At first, quintise hemlines might only be cut in a wave or gentle zigzag. Gradually, they developed fancier leaf and feather shapes. As **troubadours** came into their zenith, they gravitated toward fancy quintise shapes, which we now think of as part of a classic medieval jester look.

Beginning in the 14th century, fashions began to change rapidly. Court clothing displayed more than one style, often comprising extremes of short and long robes. **Tournaments** and **heraldry** also influenced fashions. It was the age of the parti-colored outfit; for the first time, all pieces of the surcote, tunic, and hose were coordinated to create a unified effect.

The new men's cotehardie surcote was very short and stiff to the point that its tightness around the hips impeded walking. Cotehardies might come down around the thighs like a short tunic or might end at the hips, in which case they were called courtepys. At the same time, the men's houpeland had extreme lengths: long, full sleeves that might hang to the ground

Late 14th-century dress for both men and women reached to elaborate extremes. For the upper classes, clothing was about display of wealth and social standing. Coats were either very short, barely covering the waist of hose, or very long, reaching to the feet to show off the wearer's wealth. Outer sleeves were often slashed to show off under sleeves. They were either full or very narrow; narrow sleeves required rows of buttons, a new luxury. Most people wore hats most of the time; they could be tall, wide, or wound with several yards of fabric. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance,* 1878)

and a long, full skirt that swept the floor. For riding a **horse,** there were shorter houpelands that only came to the knee.

Both these garments had tight, high collars that enclosed the neck. Some houpelands were worn with an inner tunic that had such a high frilled collar that it appears to be the forerunner of the Elizabethan lace ruff. Both cotehardie and houpeland were heavily embroidered and worn with jeweled belts. During the same period, there was a fashion for wearing belts with small **bells** hung every few inches.

The cotehardie made hose even more important, since it barely covered a man's upper legs. It had to be worn with a short inner jacket that had holes along its bottom edge. Full hose had ties called points along the top edges, and these were threaded into the holes and tied. This was called trussing the points. Hose at this time had foot pieces attached, and some hose may have been knitted. While hose were usually still separate legs, the very short courtepy made modest coverage an issue. Some tailors began joining hose into one piece with a full back and a codpiece.

The short cotehardie's showcasing of hose brought in the parti-colored fashion. Men wore one leg in a light color and one leg in a dark color. At its extreme, the parti-color fashion extended to the cotehardie's partition into contrasting colors and even the tunic's sleeves in contrast. Sometimes the wearer kept all the dark on one side and all the light on the other. In other cases, the wearer alternated light and dark on legs, body, and arms so the effect was of a walking chessboard. Long robes, too, were divided vertically into contrasting colors.

The 14th century also brought men wide, almost inconveniently large mantles. While previous mantles had been cut as a semicircle, the new mantles were full circles with one split going from outer circumference to center neck-hole. Some had only a neck hole and had to be pulled over the head. They were a great amount of fabric to manage.

During the 14th century, there was a big change in women's fashions. One development was the train, a skirt so long in back that either the wearer or a servant girl had to hold it up when she walked. At first these were usually part of a peliçon, a surcote that was open at the front and could be put on like a coat; it was usually lined with fur. Sideless gowns, first developed in the 13th century, now had very long, generous, flowing skirts.

Red was the favorite color for gowns. Paintings show noble ladies in red going to **church,** riding, and sitting at home all through the century. There was no sense among ladies that it was an embarrassment to wear the same dress as others; they are shown often in nearly identical red dresses.

In previous centuries, women's dresses had always covered their skin so only their hands and faces were showing. In the late 14th century, women began to wear dresses that left their neck and shoulders bare, although the dresses were always long sleeved. This new cotehardie gown, also called a

kirtle, had a tight-fitting bodice and a very full skirt. It had long sleeves that fitted close to the arm with rows of small buttons. As the age of tournaments entered its peak, women's cotehardies could be designed in parti-color or with the heraldic symbols of her family embroidered in quarters on her dress.

Alternately, another style of dress—the pellande—covered the wearer generously up to the neck. Both styles were fashionable at the same time and can be seen in the same paintings. It was new for women to have two very different styles to choose from, and there were also some alternatives in **hair** and hats. Although older women still wore wimples, younger women wore only hats or hairnets with an uncovered neck. Noble women had not shown so much skin since Roman times.

Both men and women wore tippets. Tippets were long ribbons of fabric or fur. They hung from the elbow, and it is difficult to tell from pictures whether they were separate accessories looped around the elbow or sewn onto the sleeves. Tippets were at least a foot long, and some fashionable tippet wearers had ribbons fluttering almost to the ground.

Buttons were invented first as decorations in the 13th century, and by the 14th century, they were in full use as fasteners. Buttons saved fabric while fastening clothing, especially sleeves, closer to the body. They were sometimes made of tin, pewter, or brass and attached to the garment without stitching. A buttonhole was made on each side of the garment, and the button itself was stuck into one of the holes and was held by a lace or cord on the other side through its shank. Buttons could also be pieces of gathered fabric, tightly wrapped with thread to make the shank of the button. With buttons came buttonholes and the methods of stitching around the round or slit holes and reinforcing a garment's buttonhole edge with a woven band of ribbon.

Buttons also helped attach separate sleeves to a tunic, permitting less washing and wear, since sleeves were likely to get dirty and unpresentable. One tunic with two sets of detachable sleeves saved fabric and expense over two whole tunics with sewn-in sleeves. A legend of Saint Catherine of Siena tells how she gave away to a **beggar** a suit of clothes, including detachable sleeves from a different tunic from the one originally given. These sleeves may have been similar enough to be somewhat interchangeable. Perhaps sleeves did not have to match the color of the tunic or gown. Detachable sleeves, like gloves and veils, could be given as favors at tournaments.

Undergarments of the 13th, 14th, and 15th centuries did not change much. Men wore baggy bloomers tucked into the same belt that held their hose. The bloomers tied above the knees or tucked into stockings. They were often called breeches, but the name meant an undergarment, not outer pants. Men also wore an undershirt, called simply the shirt. It was generally made of linen and had long sleeves. It fell past the waist. Women wore a linen chemise or smock; we don't know if they wore any kind of underpants.

In the 15th century, travel and commerce increased. As Europe's population recovered from the famines and **plagues** of the previous century, fashions began to travel more quickly among the aristocratic courts. The expanding cloth industry in Italy made it easy for Italian and French women to wear patterned silks of beautiful, intricate design. Italian hats and the Burgundian fashion for padding clothing traveled to backwater England. Men padded their shoulders and chests; women padded their stomachs. Clothing was varied, colorful, and rapidly changing.

Men at 15th-century courts wore surcotes and cotehardies with long bell sleeves and quintise or dagged edges. Parti-colored fashions might now go diagonal, and belts with bells might also be tied diagonally across the chest. Sleeves might also be shaped like great bags with auxiliary (more practical) armslits. These puffed sleeves might also be worn with padding to make the shoulders carry their weight. As the century went on, puffed shoulders, chests, and sleeves grew more exaggerated.

Short tunics, developed from the previous age's courtepy, were looser and might be worn with a belt so the short skirt flared around the hips or worn unbelted but coming only to the top of the hip. In contrast, by the middle of the 15th century, a very long, narrow robe came into fashion in France. It had fitted, padded shoulders, but it was otherwise close fitting, sometimes with pleats.

For the rest of the 15th century, men's garments used the same motifs and developed new, often-exaggerated styles. Shoulders were puffed and padded in long robes and short robes. The journade, a short but wide coat, was like a cut-off houpeland that exposed hose as much as the older courtepy. Hat styles, too, were widely different and exaggerated, either floppy and bright or tall and dark.

Women in the 15th century adopted the men's houpeland and continued to wear surcotes and mantles. Their necks were still bare, and, in some styles, so were their shoulders. The houpeland for women had a collar that lay open like a modern suit's collar, a high belt, and long, wide, trimmed sleeves. Aristocratic women were adorned with rich brocades, cloth of gold, and embroidered designs. At the same time, the alternate style of the cotehardie, or kirtle, continued to have its open neckline. Ladies of this period might envelope themselves in yards of cloth or expose neck and shoulders in a simple gown.

A peculiar 15th-century style for women was to pad their stomachs under their gowns with a stomacher. The stomacher made the women look pregnant, but it was just an ideal of beauty at that time. Paintings show noble ladies, the paragons of beauty, with extended abdomens, tiny breasts, and dramatically receding hairlines.

There was a slight development toward the modern concept of pockets, built-in carriers in clothing. Medieval people had always carried things they

needed hanging from a girdle or inside a bag on the girdle, and this bag was their pocket. In the 15th century, women's surcotes were designed with slits so the bag could be hung on the inside, not visible, but the wearer could reach in to remove things from the pocket bag.

The late Middle Ages also brought about the concept of clothing as work uniforms. In both France and England, nobles who took part in ruling the country began wearing a particular type of robe. English lords wore it when they sat in Parliament. The peers' robes often had systems of marking stripes to indicate rank. At lower levels, servants in lords' households and members of **guilds** wore livery, a colored uniform. In a guild, wearing livery was a privilege only full members could claim. In a lord's household, it was a means of supplying clothing to servants so they didn't wear mismatched or old-fashioned clothing while working. The household chose a set of colors and a design that matched the family's coat of arms. The livery included a badge with a simplified coat of arms. At the lowest level of society, poor almsmen often wore robes to signify that they belonged to a particular **hospital** or depended on a charity. The donor left money to clothe a certain number of people in a chosen color, such as black or red. Hospital workers also wore these colors. For the first time, color was used to define roles in secular society.

See also: Cloth, Clothing Accessories, Embroidery, Hair, Hats, Jewelry, Shoes.

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Clothing Accessories

In the Middle Ages, as in modern times, people used **hats** and gloves, belts and pins. They needed bags and purses to carry small things with them. Pockets had not yet been developed; all pockets were really bags of some kind, tied onto clothing.

Gloves

Mittens, with a bag for the hand and a separate compartment for the thumb, had been known in Europe since the earliest times. They were used for cold weather. During the 12th century, gloves with separate fingers began to be made. They were an expensive mark of nobility. No churchmen under the rank of bishop were permitted to wear gloves.

Gloves ceased to be winter gear from this time, although they continued to have a practical role in hawking. A hawk's talons are very sharp, so anyone who rode out **hunting** with a hawk perched on his (or her) hand needed thick leather protection. At court, however, all over Europe, gloves became a fashion statement.

These fashionable gloves were made of the thinnest leather from calves, rabbits, lambs, or even mice. (Some gloves were knitted, but they are rarely attested in archeological finds.) They had to be loose enough at the wrist to slide the whole hand in, although, during the 14th century, glove makers began to fit them with buttons. The construction of the glove was simple at first, but it gradually became more complicated, with special shapes, darts, slits, and stitches to make it fit a hand more closely. Images of kings' gloves, preserved in tomb effigies, show that their gloves were very decorated, with bands of **embroidery** on the cuffs or on the back of the hand.

The conventions for wearing gloves were complicated. Nobles wore rings over their gloves and kept gloves on indoors. On the other hand, it was an insult to greet someone with a handshake while wearing a glove, so frequently the right glove was removed in company and tucked into a belt. Throwing a glove down on the floor meant giving a challenge to combat. If a lady dropped her glove, an admirer would rush to pick it up and might request to keep it. Some **knights** wore a lady's glove as a banner. It was rude to enter a **church** wearing gloves, but the dead were always gloved for burial. Bishops wore jeweled gloves for some special Masses and put large pontifical rings over their gloved fingers.

Purses

Purses were important to both men and women and were not carried only by women. Some may have been as large as modern messenger bags,

particularly if they were for carrying game, but the average daily purse for **coins** and small objects was no more than six inches tall.

The strongest and most practical material for making a small money pouch was deerskin or goatskin. It was tough, and it didn't fray like **cloth.** One simple pouch design was to fold a piece of leather in half, stitch its sides, and cut slits around the top for a drawstring thong of leather. The drawstring, tied in a loop, made a good way to attach the pouch to the girdle and leave the hands free. Finer leather purses were finished and tasseled with silk tablet-woven braid.

Cloth purses became popular in the later Middle Ages. The finest were made of silk brocade and velvet, while the common ones were made from linen. Since purses did not use much cloth, perhaps their makers could buy or use scraps left from sewing clothes.

A larger purse for men came into use in the late 14th and 15th centuries. It was made of leather, but it folded over with a flap. Some may have buckled closed. It had loops at the top or back to run the owner's girdle through so it was held more securely than a hanging drawstring bag. These leather purses, of course, were tooled, dyed, and decorated with mounts and silk finishings.

Garters and Girdles

Garters held up loose hose, and, by the middle of the 14th century, they had become a foppish dress accessory for men. Early garters had been cross-garters, a method of wrapping the leg covering in long strips of cloth or leather to hold on the wrappings that formed both socks and pants during the Carolingian era. Garters from the 14th century were loops tied or buckled around the leg, and they could be jeweled. They could be made of strips of leather or cloth, but some were woven on purpose and had fringe.

Belts were often called girdles in medieval English. They were not used to hold pants up with belt loops; they were used to hold a loose garment closer to the body. Men and women wore them, and both called them girdles. Fashions for girdles changed many times. At times, the fashion was to wear a very long girdle with the end hanging down to the knees in front. Sometimes they were worn so loosely around the hips that they must have been more of a fashion accessory than a practical tie.

Girdles were sometimes made of tablet-woven braid and sometimes of leather; both kinds were fitted with metal buckles. Tablet weaving could use silk, wool, or linen; linen was the cheapest and lowest status of the three. Tablet-woven girdles were striped or had repeating geometric patterns. Leather girdles were simple when worn by common men. Leather girdles worn by the gentry, however, were tooled. They were stamped with

Brass effigy engravings tell us much of what we know about later medieval clothing. This 12th-century English earl wears a typical man's girdle over his mail and surcote. It is decorated with brass or copper mounts. Its long strap has been secured with a large knot; most images of men's girdles show this kind of knot. He has a second strap over his shoulders, probably to hold his sword, but perhaps as part of a purse. (Duncan Walker/iStockPhoto)

repeating geometric designs or engraved with mottos. Some had designs cut out of the leather or metal decorations riveted on. The end of the girdle often had a decorative **silver** piece that acted as a weight to keep the girdle hanging straight.

Decorative rivets, generally called mounts, came on girdles, straps, and harness of all kinds. They were also attached to **furniture, book** covers, and caskets. Some were made of wrought **iron,** while others were punched from sheets of **copper** or iron. They were domed or flat, plain or stamped with an additional design. The most basic mount shape was a circle, which could be stamped with a **heraldic** design: star, sun, lion, fleur-de-lis, or shield. The most expensive were enameled; the cheapest were a small, simple dome. There were lobed variations on circles: the trefoil, with three round lobes; the quatrefoil with four; the cinquefoil with five; and the sexfoil, septfoil, octofoil, and multifoil. The trefoil, quatrefoil, and cinquefoil were very common decorative mount shapes. They could be formed to look more like flowers in many cases. Another simple mount design was square. As with round, square or rectangular mounts often had heraldic designs to dress them up. Most expensively, mounts could be shaped into leaves, shells, stars, fleur-de-lis, or other interesting shapes.

Jingle **bells** were fashionable girdle accessories in the 14th century. There are many illustrations showing little round bells hanging from ribbons on

courtiers' girdles. Tumblers and jesters had been wearing bells on their hoods for the previous century. With this association, it seems most likely that courtiers' bells were festival decorations, perhaps for **holiday** dancing.

See also: Cloth, Clothing, Jewelry, Hats.

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Coal

Coal became the new fuel of the later Middle Ages and was more necessary as the **forests** became depleted. The Romans had found coal in Britain and used it as fuel, but after the close of the empire, coal was neglected in favor of wood. During the 12th century, with the cost of wood going up, people again began to burn coal. They called it sea coal to distinguish it from charcoal, the charred-wood product they normally called coal. Sea coal may have been found, literally, in lumps on beaches, or it may have arrived in a boat over the sea, having been shipped from its mine.

The area of England around the river Tyne was an early coal-mining region. Coal seams were exposed to view and could easily be mined in shallow pits. In England, the Forest Charter of 1217 had ensured the rights of landowners to minerals found on their land, unless they were precious metals the king would claim. Coal belonged to the landowner, rather than the Crown. But coal was not mined extensively at first, partly because much of the land was owned by the **church.** Shallow mining did not require much investment, but after the shallow pits had been emptied, miners had to dig tunnels. Tunneling was much more expensive and required pumps to clear out water as they dug deeper. The church was not interested in making a capital investment in an industry that was not directly connected to the agricultural projects its **monasteries** usually carried out. During the 1530s, the English government seized all monastic property and sold it to private parties. The new owners of coal-bearing land began to develop deeper mines for profit.

Coal's first major use was in industrial burning, not home heating. Industries that used fire as their main process had a constant need for fuel, and

wood had become scarce and expensive. Lime kilns burned limestone to make lime for cement, and **iron** forges had to melt iron ore to extract iron. Other industries, such as **glass** making, brewing, and dyeing, also used large fires.

Coal dug from shallow mines was of poor quality and gave off noxious sulphur fumes, so it was not used in homes. People hated the smell. Coal smoke in London produced the first real industrial pollution, and the **city** tried to regulate or ban it during the early 14th century. Medieval people believed disease came from bad air, so they were more sensitive to the issue of air pollution than even modern people who understand germ theory.

See also: Forests, Iron.

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Coins

The Roman Empire had minted coins and spread the custom of their use, and all former Roman lands continued to use either old Roman coins or their own crude imitations. More backward regions of Europe in the early Middle Ages still used either barter or **gold** and **silver** treasures for payment of goods. Their acceptance of coins came with the acceptance of Christianity and its closer ties to mainstream Europe. Places that were farther away were the slowest to adopt the use of coins; Finland and Russia did not fully adopt currency until the close of the Middle Ages.

During the classical period in both Greece and Rome, the technique for striking coins used heated gold or silver planchets (blank disks). They used well-carved dies and were able to achieve accurately struck coins with letters and designs in high relief. These coins have held up well over the ages. In medieval Europe, this technique was lost, and mints struck coins out of cold sheets of silver with badly carved dies. The dies were made of **iron** cylinders with the design cut into them with punches and other engraving tools. These die-cutting punches were formed like wedges, circles, and bars, and the letters and images were formed from these shapes. The relief was not high, and surviving coins can be badly worn down. Letters were sometimes cut backward. By the 15th century, coin-minting technique had improved.

The value of a coin was based on its **weight,** since it was defined as a certain weight of gold, silver, or copper. The words for weight and money were identical in many cases (the English pound, the German mark). Unless a

merchant had an accurate balance for weighing coins, he would not be able to tell whether a coin was accurate. The dies used to strike coins were nearly always circular, but the coins were not. A medieval coin often bulged beyond the edges of its stamp. This provided an opportunity for a dishonest trader to shave the metal down to the stamp, or even just inside its circle, and collect the shavings for resale. If a mint had made a coin improperly, it could be heavier than it needed to be. In medieval Germany, private individuals were not permitted to own balances out of fear they would find the heavy coins and trim them for profit. Coins could also be made from impure metal. The ruler who authorized the coin was supposed to guarantee the metal's purity, but coins could be forged, and even some rulers were dishonest.

When a type of coin was considered debased because too many had been shaved, the coins had to be recalled back to the mint, where they were melted and restruck. The mint skimmed a fee, issuing fewer coins than it had taken in, and the overseer of a mint could become very wealthy. The right to operate a mint granted a very lucrative favor.

There were more coin designs across Europe than anyone could keep track of because coins were reissued with a new design for every new king. Not only that, but every region had several mints, and each might make its coins a little bit different. The map of Europe was much more complicated during the Middle Ages than it is now. Any single modern nation, no matter how small, was cut into smaller units: counties, principalities, and duchies. The Netherlands, one of modern Europe's smaller nations, was divided into the counties of Friesland, Holland, Zeeland, Flanders, Hainault, and Limburg; the duchies of Gelderland and Brabant; and the bishoprics of Liège and Utrecht. Each count, duke, and bishop could mint his own coins.

In any given time, at any given place, coins from many places were in circulation. Coins from Islamic regions have been found in Scandinavia. The coins of England and Ireland circulated freely with full value after the English conquered Ireland. Certain coins were more popular at certain times, and these foreign coins might be preferred in trade over the local coins. At major trade **fairs** and market towns, coins of all denominations were in use. By the time of the **Crusades,** there were specialists in international currency exchange. During the late Middle Ages, large commercial firms maintained branches in multiple cities and used currency exchanges to disguise interest on loans. They could lend in one currency and receive in another.

Most medieval coins were struck from silver. Silver had been mined around the Mediterranean for many centuries; it existed in deposits of **lead** and **copper** and had to be separated and purified. Deposits of silver were discovered in Germany and Bohemia during the Middle Ages. Gold had

to be imported from outside Europe and was much more valuable. By the 13th century, rising prosperity in the Italian republics prompted them to begin issuing gold coins. These coins were worth much more than silver coins, so they could be used more efficiently for large volumes of trade.

Most European coins used the Latin **alphabet** and spelled proper names as Latin words. Roman numerals were the only numbers until the 15th century, when a Swiss coin first used the new Arabic numbers. Coins from **Muslim** Spain used Arabic, and Byzantine coins were in Greek. Some European moneyers in Christian countries struck coins with Arabic inscriptions, intending them to be used in trade with Spain or North Africa. Anglo-Saxon coins from the early Middle Ages used runes to spell a king's name, as did Swedish and Norwegian coins. Primitive Russian coins used Cyrillic letters, and, rarest of all, some **Jewish** moneyers in Poland struck coins with Hebrew letters.

Countries and Their Coins

Italy's coin history stretches back to the Roman Empire, whose coins became the model for all later coins. Italy, like the rest of Europe, became fragmented into many principalities during the years of barbarian invasions, first Goths and then Lombards. The only strong kingdom in medieval Italy was not of Italian origin; invading Normans had created the kingdom of Sicily, which included most of Italy south of Naples, as well as the island of Sicily itself. But the real centers of power became the commercial cities: Milan, Genoa, Venice, Florence, Pisa, and others. The doge of Venice produced a fine silver grosso, of greater value than previous coins, for trade connected with the Fourth Crusade. Venice's grosso was copied by other cities, which attempted to keep its value the same but with an added local design, such as a lily for Florence. Gold coins produced in the 13th century became the international standard of European trade, including the gold florin of Florence and the gold ducat of Venice.

In the early Frankish kingdom, under the weak Merovingian kings, local barons struck coins in both the king's name and their own names. There was no central control over coins. Around 790, Charlemagne reformed Frankish currency in a way that defined European coinage for a thousand years. He created a silver penny, the denarius (denier in later medieval French), such that 240 of them weighed a pound. The solidus was an intermediate value, worth 12 pennies; 20 solidi (shillings in English) made a pound. The only actual coin, though, was the denarius, or penny. Carolingian pennies were struck with high-quality dies, with very high relief in the images. Charlemagne wished to have the coins all minted at his capital, Aachen, but instead, coins were minted regionally, in places like Rheims, Rouen, Paris, Lyon, Strasbourg, Maastricht, Milan, Pavia, and others. After the Carolingian dy-

The new wealth of the Italian cities spurred them to create new coins that were worth more than the usual silver pieces in European circulation. One of the first was Florence's gold florin. The florin remained one of the primary currencies well into the Renaissance. (Museo Nazionale del Bargello, Florence, Italy/The Bridgeman Art Library)

nasty's power weakened, minting again became decentralized. Duke, counts, bishops, and even abbots minted their own coins. These coins were of uneven value; dishonest moneyers could mix a lesser-value metal into the silver or gold.

After 1000, the French kings began to regain central authority and took back the mints. Louis IX ordered that only his coins would have value throughout the kingdom; local mints had only local value. The royal coins were better regulated and were struck with better designs, and they introduced a gold coin. However, after the French kings were weakened by the Hundred Years' War with England, local dukes and counts again took back coinage. All through the Middle Ages, coin production, and the power it represented, shifted back and forth between the king and his lords, and it was not fully centralized until after the end of the Middle Ages. Around 1300, King Philip of France devalued the currency three times. Each time, coins were recalled and made smaller so that more coins could be made from the same gold and silver. The people rioted as prices soared.

Germany was originally part of the Frankish kingdom, and its coin traditions were the same as France's. In the 15th century, a huge silver deposit was discovered in the Tyrol region of Germany. At the close of the Middle Ages, in 1500, the German king began to issue new large silver coins, called talers, to compete with the Italian gold coins.

Under Anglo-Saxon rule, many different small kingdoms minted their own coins, but after the Norman conquest, coins were more centralized. There were still many mints, usually one in every large regional town. During the 13th century, some kings tried to reform and regulate the currency. King Henry III ordered a coin design in 1247 that extended the arm of a cross right to the edge of the coin so people could tell if it had been clipped or shaved. His son, King Edward I, ordered a new coinage in 1279 and created new halfpennies and farthings to prevent people from actually cutting silver pennies. All his new coins bore the same well-designed image, which was subsequently copied all over Europe. He also centralized coin minting so coins no longer bore a mark of each mint but were more regulated in their production than before. King Edward III introduced a gold coin, the noble, in 1344. By the end of the medieval period, English coins came in nobles (six shillings and eight pence), shillings, groats (four pennies), pennies (also called pence), halfpennies, and farthings (quarter pennies).

The dominant coin of the Mediterranean region was the Byzantine gold solidus, or nomisma. Its minting remained very standard from the period of early Byzantine power through the 11th century. The front of the coin showed an image of the empire, and where Roman coins had showed a profile, these coins showed a face looking straight out from the coin. The other side showed another member of the imperial family, a design of crosses, or an image of Jesus or Mary. As the empire declined, its coin became debased and also changed its shape, becoming flatter and wider. After 1100, three

The silver penny was medieval Europe's most universal coin. Coins were stamped with the current king's image or symbol, or with a date in Roman numerals, so that coiners could keep track of how old a coin was. Old, devalued silver coins were routinely melted down and recast. Medieval kings were in a continual struggle against people who clipped and pared coins, since commerce depended on people's trust in the value of a coin. An old coin had no antique value; new coins were more likely to be full weight. (Martin McCarthy)

coins were circulated in the empire: gold, silver, and copper. All had images of Jesus, **saints,** or emperors.

The Crusader kingdoms were part of the Byzantine Empire's decline, since they took away territory and trade. The Crusader kingdoms of Antioch and Edessa struck their own coins during the 12th century, at the beginning of their tenure as independent kingdoms. These coins were copper and showed images of saints; one showed Saint George slaying a dragon. They used Latin letters but sometimes mixed in Greek letters since these were better understood in that region.

Muslim Spanish coins were different from Christian coins. Muslims prohibited the reproduction of an image of a person's face, so their coins never had royal portraits. After Abd Al-Rahman took the title caliph, breaking away from the new dynasty in Baghdad, he designed new silver and gold coins that did not change between 929 and 1031. From then until the capture of Seville by northern Christian kings in 1212, the Almohad dynasty struck coins of a distinctive nature; unlike other coins, they were square. Each Christian kingdom of Spain struck its own coins, but, throughout the Middle Ages, the kingdoms were gradually united by marriages, and the number of coins gradually reduced. When Isabella of Castile married Ferdinand of Aragon at the end of the 15th century, the Christian kingdoms were all united, and the new coin with its double profile of the joint sovereigns symbolized the newly resurgent Christian Spain.

The barbarian frontiers of medieval Europe were Scandinavia and Russia. Russia's ruling dynasty had come from Scandinavian Vikings who settled in Kiev, and the regions frequently traded. The Vikings did not understand the concept of coins at first; they treated coins as trinkets and were just as likely to pay for goods with gold rings and other treasures. Their usual use of silver and gold, whether in coins, lumps, or rings, was to hoard it in case they needed to pay a ransom. Gradually, trade with the rest of Europe normalized their use of foreign coins, and they also cut small irregular pieces of silver to use in trade. After some of the Danish Vikings settled in northern England, they began striking coins. Denmark was striking coins by the mid-11th century, and its coins became the usual currency of Scandinavia. Finland did not begin to use coins until it became part of Sweden in the late Middle Ages.

In Russia, the prince of Kiev began minting coins after accepting Byzantine Christianity, but they were not much used through most of the Middle Ages. Russians to the north either used small amounts of foreign currency (German or English) or bartered with silver ingots or other fragments of precious metal. Silver ingots were called grivnas and were shaped as hexagonal bars in Kiev. Northern grivnas, made in Novgorod, were thinner and sometimes curved. The Tartar conquest brought an influx of Islamic coins, and German settlement of the Baltic region toward Slavic lands (modern

Lithuania) introduced German coins. True Russian coins were not struck until the late 14th century. Prince Dmitri Donskoi of Moscow issued the ruble and a coin that was 1/200 of the ruble, called a denga. The Russian word for money is still *dengi,* although the denga itself did not last much past the close of the Middle Ages and was replaced by the kopeck.

See also: Alphabet, Banks, Gold and Silver, Seals, Weights and Measures.

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Compass and Navigation

The magnetic compass was one of the outstanding discoveries of medieval times. It led to the European journeys of discovery that are a major part of postmedieval history. Without a compass, a ship's captain needed the sun or stars to identify north. He could not sail away from land with confidence because he could not know his direction on cloudy nights. With the compass, the development of specialized **maps** for the sea, and the introduction of the sandglass and **astrolabe,** sailing navigation became a precision craft that allowed **ships** to sail year-round and away from land.

Compass

The compass began with the Chinese discovery of magnetism. Their earliest compass was a piece of lodestone, a naturally occurring magnetic **iron** ore (magnetite). They learned to rub an iron needle on lodestone to mag-

netize it and then either hang the needle from a strand of silk or put it through a straw or a bit of wood in a bowl of water. Free-floating, the needle would swing to a north-south position. This basic compass almost certainly made its way from China to Europe via the Silk Road, perhaps because of its usefulness in travel or because it may also have had astrological purposes.

Several medieval **books** and poems make references to compasses in use in the Mediterranean during the 12th and 13th centuries. The earliest 12th-centry reference by the English scholar Alexander Neckham described a compass that was still in the Chinese form, a needle floating on a wood chip in water. This compass could be made as needed with a lodestone, a bowl, and a needle, but it was not completely useful since its accuracy depended on keeping the bowl of water steady. The next development of a true compass is credited to the sailors of Amalfi, particularly to Flavio Gioia. When a monk, Peter the Pilgrim, described the compass in use in southern Italy in 1269, he described a true instrument in a box. By the end of the century, compass use was routine and widespread.

The medieval compass was a circular card marked with 32 directional points. The card was placed below a free-swinging magnetized needle attached to a dry pivot and housed in a wooden box. The compass rose that points to north, south, east, and west was developed by the sailors of Amalfi. Europe had not yet adopted the 360-degree directional convention.

Navigators knew the needle pointed to the north magnetic pole, not to true north, and made adjustments for that fact. Use of the compass became common first in the Mediterranean Sea, which in many places was too deep for sailors to determine their position by sounding, the traditional method of determining the water's depth. The compass was less used in the shallower northern waters, such as the Baltic Sea and the North Sea, where sounding continued to be the main navigational tool.

Other Instruments

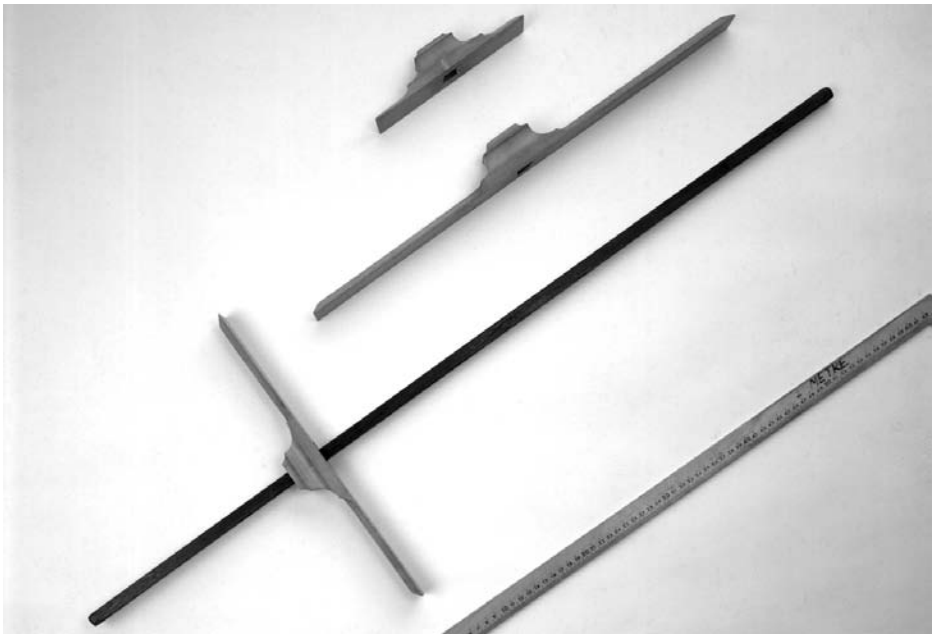
The hourglass, or sand glass, was the ship's only **clock;** there are records of its use in the 14th century, although it could have been used earlier. On a ship, the hourglass was turned every 30 minutes. A crew member (often the cabin boy) was assigned to keep careful watch and to strike a **bell** when he turned the glass over. The number of bells told the time. An hourglass also was used in calculating a ship's speed to determine its location. A piece of wood was attached to a rope that had knots tied in it at measured intervals. This wood was let down to the water to trail from the back of the ship while a ship's officer timed the seconds between knots and calculated the speed. (This is why speeds at sea are spoken of in knots.)

The hourglass had to be carefully calibrated by its maker with exactly the right amount of dry sand or pulverized eggshell. The sand had to maintain

a steady rate of flow and had to be fine enough not to erode the glass opening it passed through. The glass bulbs had to have the right angle to keep the sand flowing evenly. For accuracy, the hourglass was set on a flat, even surface. Because a ship at sea is constantly heaving up and down on the waves, the hourglass was often hung by a cord in a holder that allowed the hourglass to be easily turned over.

The astrolabe, borrowed from astronomy, became a way to find position at sea some time during the 13th century, but it is unclear how widely it was used until the 15th century. The form developed for use at sea became different from the astronomical tool, both simpler and more practical. It had a heavy brass ring with an alidade for sighting a star or the sun. It was a ring, not a plate, because when a sailor held it by its top ring, the wind at sea blew it so it was hard to use; a ring offered less surface for the wind than a plate. Because it was so difficult, it was easier for a ship to use it for determining the latitude of an island when they were at anchor or on land.

An even simpler instrument came into use in the middle of the 15th century. The quadrant became the primary tool for determining a star's altitude.



A modern yardstick sits next to a medieval cross-staff with two spare transoms that are longer and shorter than the one in use. The transom slid along the staff until its top and bottom were aligned with the horizon and a target star. Markings along the staff measured how far the transom had slid, and this could be translated into knowledge of where the ship was on a special map. (SSPL/Getty Images)

It had an arc marked off in degrees and an alidade sighting tool along one side. A plumb bob (a string with a pointed lead weight) hung from the other side. As one sailor held the quadrant steady, lined up between his eye and the star, another read the degree where the lead pointer hung.

The cross-staff may have been invented by a Dutch sailor in the 13th century. It measured the angle between the horizon and a star, most usefully the North Star. It was a simple shaft held up to eye level and a moving crossbar called the transom. When the bottom of the transom was at the horizon and the top at the target star, the distance mark along the staff could tell the viewer's position with the help of a chart made for the cross-staff.

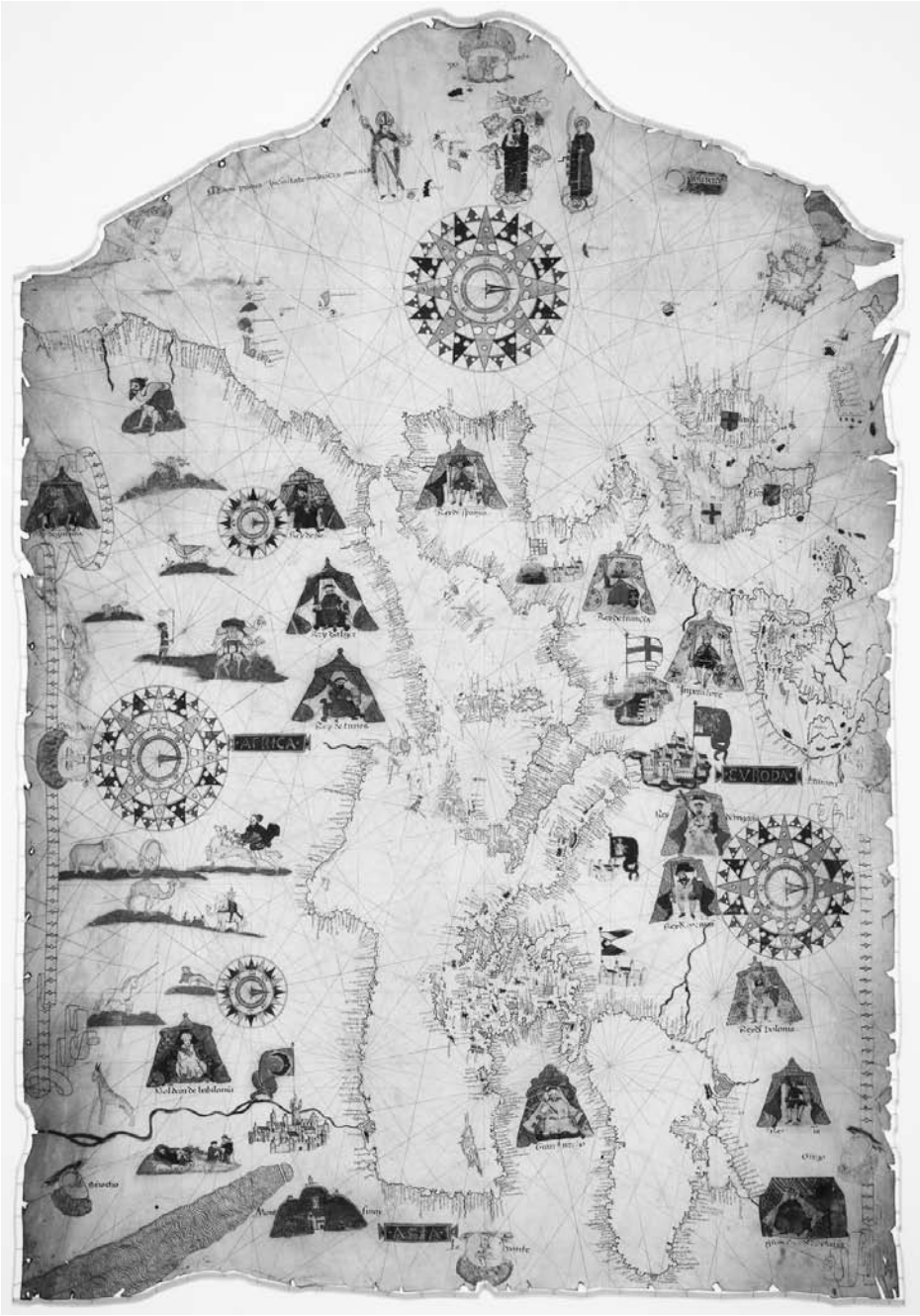
Soundings, Buoys, and Sea Charts

In ancient and medieval times, sounding was done by dropping a weighted rope until it touched bottom and then measuring that depth. Soundings were taken to see whether the ship was about to run onto rocks and also to help establish the position of the ship. Soundings were usually taken by using a rope coated with tallow. A big wad of tallow on the end of the rope could bring up sand or gravel to show what the sea bottom was like and help the captain estimate the position of the ship.

Sounding was useful in the Baltic Sea, where the water was not very deep and the coastlines were shallow, but less useful in the much deeper Atlantic Ocean and Mediterranean Sea. The Baltic region was also an early adopter of channel markers. Many of the flat shorelines had few landmarks visible from a ship, which had to navigate through shallow water and identify the correct river mouth to enter. There were established sea routes between the **cities** in the Hanseatic League; cities established several kinds of markers to help navigators identify their location.

Archaeologists believe buoys were used as channel markers as early as 1066 on the River Weser. Buoys marked the entrance to the Zuider Zee beginning in 1323, a practice that spread in following years. Early buoys may have been small, watertight **barrels.** Sometimes buoys were marked to show whether a channel was going upstream or downstream. The marker was a besom, a bundle of twigs attached to a handle, which was placed with its point upward for one direction, downward for the other.

The Mediterranean Sea had known lighthouses during Greek and Roman times, but many had fallen into disrepair. In Northern Europe, there was no early lighthouse tradition except of lighting beacons in bad weather in some places. The first known European lighthouse was in use in 1202, with more lighthouses established later in that century. Large wooden beacons with distinctive topmarks also were placed to identify localities. By 1280, lighted beacons marked the location of some rivers. Lighthouses also were



Portolan charts were among the most detailed early maps, because they had the most practical purpose: finding a harbor. Scale did not matter, but capes, rivers, towns, and other landmarks along the shoreline had to be in correct and detailed order. They were usually drawn on parchment, which came in large animal-sized sheets and was very strong even under hard use. (Library of Congress)

established along the shores of the Strait of Dover, the earliest being at Winchelsea in 1261 and on the Isle of Wight in 1314.

The portolan was essentially a port-finding chart or map. For several centuries, Mediterranean seamen wrote down information about ports, tides, winds, and dangerous coastlines. Gradually, this information was written into pilot guides (in Greek they were called *peripli* and in Italian *portolani*). Portolan sea charts were mapped versions of these guides.

A portolan showed highly detailed coastlines marked with ports, sources of water, and hazards such as reefs or pirates. The names of the ports, capes, and so on were written at right angles to the coast, on the inland side so as not to obscure the coastline. There was no attempt to show scale of distances accurately or to be true to how maps were made, and there was no up or down to the portolan.

The most distinguishing feature is a network of rhumb lines (lines of a specific geographic direction). These are straight lines for navigation; 16 lines radiate from a central point. The lines were often color coded for the main directions (north, south, east, and west) and the intermediate directions (northeast, southeast, northwest, and southwest). The lines ran through 16 intersecting compass stars, giving a navigator a continuum of straight navigation lines he could use to work his way to the desired port by using his mariner's compass for navigating by dead reckoning. Other aids were log lines to estimate distance and an hourglass for telling time.

See also: Astrolabe, Clocks, Maps, Ships.

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Cosmetics

In the Roman Empire, cosmetics were highly developed, and it is likely much of this art was preserved in Constantinople, as well as in Italy. The primitive Franks and Anglo-Saxons made little use of cosmetics, if any, until they began to imitate the civilized customs of the Byzantine Empire.

Unfortunately, some Roman cosmetics contained high amounts of poisonous **lead,** but it was not known as a poison at the time.

Romans used skin cleansers made of lupin seeds, orris root, and honey, or they made face packs with eggs and herbs. They routinely had sweat baths and then had their skin scraped, oiled, shaved, and tweezed. Romans were heavy users of perfumes made with animal fat and exotic, rich-smelling ingredients like myrrh, pomegranate, cassia, and cinnamon. We know that wealthy society in Constantinople continued to make Roman perfumes. Archeologists have found many beautiful Byzantine jars and pots made of **pottery** and **glass** that almost certainly held perfumes and cosmetics such as rouge.

Dangerous Roman cosmetics traditions involved changing the color of the face. **Women** wanted to exaggerate the whiteness of their skin, as well as highlight their eyes with black. They could rub chalk into their faces and outline their eyes with lampblack soot, but more often they used lead. White lead was a pure white crust that grew on lead when it was exposed to ammonia, and it formed the basis of white paint, but it was also used to produce white skin. Eyeliner was more often kohl, made of galena dust, which is pure lead.

To play up red tones in skin and lips, Roman ladies had relatively harmless lip paints and rouges made of red plants in animal fat. After the Roman army conquered the northern Germanic and British tribes, some Roman ladies tried to bleach their hair with lye and henna to make it red or blonde like the northerners' hair.

In the medieval **Islamic** countries, as in the Byzantine region, women used kohl as eye shadow and eyeliner, and they used perfumes a great deal. They lightened their hair with henna and tweezed or waxed unwanted hair. Crusaders who visited these countries may have brought back new ideas about cosmetics.

During the early Middle Ages in Northern Europe before the Crusades, there is little evidence for cosmetics use, although their red clothing dye, madder, could have been used to tint lips or cheeks. Most early medieval texts that discuss a woman's beauty focus on natural beauty and washing. The medical book by the legendary Dame Trotula, in the 11th century, recommended bathing in seawater and using herbs for deodorizing purposes. Washing was the beginning of beauty, and it was a luxury difficult for the common man to achieve. In addition to cleanliness, beauty was achieved by braiding hair in elaborate ways and wearing a great deal of **gold** jewelry.

Good smells were considered healthy, since bad air was one cause of disease in medieval minds. Perfume, **spices,** and incense were a matter of health, not just attraction. Roses and violets were two common scents based on native flowers. A number of other herbs were used to scent laundry and

stored clothing, including lavender and balsam (pine needles). The first real perfumes were made by pressing flowers into pure lard or almond oil, and then straining the lard and repeating until it was scented like flowers. Violets and roses could be treated this way with success.

In addition to cleanliness and good smells, there is evidence for two strong folk traditions for female beauty, which then led to cosmetics use. Like Romans, Europeans had traditionally valued white skin that contrasted sharply with red lips or cheeks. Folk tales always emphasize the white skin and red cheeks of the beautiful heroine or princess. As increased travel and trade brought new ideas into Europe, court ladies began to use simple remedies to imitate this ideal beauty.

Cosmetics had to be made by the user or her servants, since they were not sold ready-made until after the close of the Middle Ages. The basic skin-whitening preparation involved making a white powder and then mixing it with rose water when needed. One 13th-century recipe called for sprouting wheat in water for two weeks and then grinding it finely and straining it to produce a pure white flour. Another recipe called for ceruse (white lead) and herbs to be boiled, strained, and dried for white powder. Lye and fat, the precursors of soap, could also whiten skin if the lye had not all been neutralized. Rouge could be made of sheep fat, with white or pink tints. Not only madder but chips of brazilwood, another dye for **cloth** and **paints,** could make a good red tint.

Rose water was the basis for nearly all homemade perfumes and cosmetics. It could be distilled to make its perfume stronger. Other flowers were soaked or boiled in water, and these waters were distilled to make more concentrated lavender or violet waters. Any time a substance had to be mixed into water, nothing but a distilled flower water would do. Wine was the other common liquid base. Wine had a mild disinfecting quality, since it was alcoholic, and it was suitably expensive.

Herbs were both medicine and perfume in medieval cosmetics preparations. One medieval book recommended boiling rosemary and wine to make a good skin cleanser, and another book suggested adding fennel and rose powder. For stubborn blemishes, honey, another suitably expensive ingredient, was recommended, boiled with chamomile. Madonna lily root helped with wrinkles, and rose oil and catmint were thought to remove scars.

Tooth care was not well developed, but white teeth and good breath were desirable. Strawberry juice was said to help whiten teeth, and, like wine and honey, it was not easily or cheaply available, so aristocratic ladies could feel good about the privilege they exercised in using it. One toothpaste recipe has survived. Its ingredients include several kinds of polishing grit, such as crushed seashells, pumice, antlers, and cuttle bones. It could not have been pleasant to use; its other ingredients included alum, nitre, reeds, burnt roots

Plants were the basis of most cosmetics. The beautiful Madonna lily was a common flower in home and monastic gardens, but it could be used to make an anti-wrinkle potion. Whether it worked or not, at least it was harmless, unlike lead-based preparations. (Galina Samoylovich/Dreamstime.com)

of an iris, and a flower called aristologia. A 13th-century health treatise suggested a more pleasant treatment for bad breath: inhaling roses, mint, and other herbs as they slowly burned over a small charcoal fire.

The late Middle Ages brought some distinctive fashions in ladies' beauty. Paintings show us fine ladies with protruding stomachs as though they are pregnant, very white skin, and a dramatically receding hairline. Some of the ladies are clearly Italian, but a high percentage of them are shown with blonde **hair.** Cosmetics use and artificial appearances had finally become more common in the 15th century. The admired posture and figure could be achieved not only by slumping a bit, but also by using a padded stomacher. Henna, lye, lemon, and sunshine were bleaching hair blonde, a fashionable color in Italy. But the key point in women's beauty seems to have been the very high forehead. Women wore their hair pulled back tightly and used tweezers to pluck hairs to make their hairline recede almost to the middle of their head. Eyebrows were also plucked to be narrow, high, and arched.

Tweezers were not new to the 15th century. There had been many beauty aids, starting with simple combs, available even to the Vikings. They also had toothpicks and simple toothbrushes, curling irons, and ear scoops. Since Roman times, a popular set of utensils came on a ring: tweezers, toothpicks, and ear scoops. There were also curling irons that had to be heated in a fire but could produce artificial waves. The rich had small mirrors. They were highly polished metal at first, but, in the 15th century, some mirrors were made of **glass** backed by **silver.** Mirrors found by archeologists tend to be

very decorative compacts made of silver, ivory, or bone; they were real luxuries and status symbols.

The close of the Middle Ages also saw a big step forward in perfumes. Roman perfumes had been based in fat, which can slowly draw the scent out of flowers. In the Arabic regions, they had begun using alcohol to distill flower scents. In the 14th century, three alcohol-based perfumes came out in Europe. The first was called Hungary Water. It was supposedly popularized by Elizabeth, queen of Hungary, in a document claiming she had received the idea from a hermit. Into aqua vitae (alcohol distilled from beer to a higher concentration) went rosemary and sometimes other flowers such as lavender. Eau de Chypre was a more exotic import from the Mediterranean region; its ingredients were not native to Northern Europe. Tragacanth (a dried sap of the Astralagus legume native to the Middle East), styrax (a tropical shrub), calamus (a water plant native to India), and labdanum (a resin from a Mediterranean shrub) must have produced a truly exotic smell for European royalty. Less exotic Carmelite Water distilled lemon balm and lemon peel in alcohol with nutmeg, cloves, coriander, angelica root, and elderflower. Lemon could only come from the citrus-growing Mediterranean region.

See also: Hair, Hygiene.

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Copper. *See* Lead and Copper

Crusades

The Crusades were a series of religiously motivated wars that began in the 11th century and ended in the 14th. Most of the Crusades were wars against **Muslim** strongholds and rulers in Egypt, Syria, and Palestine, but some Crusades were staged within Europe. The original motivation for the First Crusade was to push back Muslim Turkish control of Jerusalem and create safe roads for European **pilgrims.** Constantinople had been at war with first the Arabic Muslims and then the new Turkish invaders, but they were not as successful in land battles as at sea. Turkish conquest and brutality prompted the Byzantine emperor Alexis Comnenus to write a letter to Pope Urban II asking for military assistance. The Pope's call to European

knights, given in a speech at Clermont, France, launched the First Crusade in 1095.

European trade with the East increased dramatically during and after the Crusades. The Muslim conquest of Byzantine territory in Palestine and Egypt had blocked most European trade with these places for several centuries. By establishing a European kingdom in Palestine, the Crusaders reconnected Europe with the regions around Constantinople. Trade in **spices** and **cloth** was influenced first as Asian spices, silk, and cotton came to Italy and then to the rest of Europe. New ideas in **clothing** fashions, **food,** and manners also came through the Crusaders to Europe.

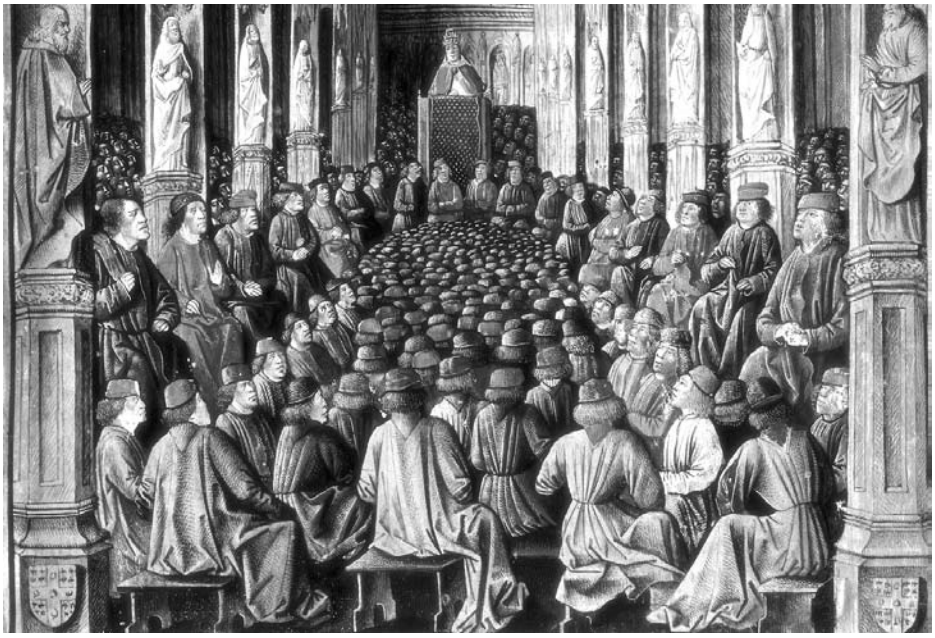
Holy Land Crusades

In the four centuries following the Arab conquest of Jerusalem in 638, the city had changed its policy toward Christian pilgrims several times. Charlemagne negotiated a deal with Caliph Harun al-Rashid to maintain a hostelry for Roman Catholic pilgrims in Jerusalem. In the eighth and ninth centuries, under Fatimid rule, there were periodic massacres of pilgrims and Byzantine monks who lived in Palestine. In 1009, Caliph al-Hakim of Egypt ordered the destruction of the Church of the Holy Sepulcher and the cave-tomb under it. The Byzantine emperor arranged for some reconstruction later in that century, but it remained largely in ruins. The Seljuk Turks invaded the region and seized Jerusalem around 1073; they massacred the inhabitants of nearby cities. Bandits contributed to making the roads in Palestine very unsafe.

The First Crusade began in 1095 with an appeal by Pope Urban II to the assembled bishops and knights of Western Europe. He called on them to cease fighting with each other, unite, and save the Holy Land for Christians. He promised that those who joined the war for the Cross would have their sins forgiven. The Crusaders were primarily drawn from the warlike Franks and Normans, who lived in France, Germany, Sicily, and England.

The promise to go and fight for the Holy Land was called "taking the Cross." Those who had vowed not to stop until they had reached Jerusalem and struck their blow were permitted to wear a cloth cross prominently on their **clothing.** Crusaders made cross banners and painted crosses on their shields. At the time of the First Crusade, the word *crusade* had not been coined. The knights referred to themselves as pilgrims. In later Crusades, the Latin word *crucesignatus* meant "one signed with the Cross." The last form of the word, which became the modern word *crusade,* was French *croisade,* "the way of the Cross."

The first wave of Crusaders was composed of mostly Norman knights from England, France, and Sicily. The count of Boulogne, the duke of Lorraine, the duke of Normandy, the count of Toulouse, the viscount of



In the 15th century, an artist looked back on the historic Council of Clermont where Pope Urban II first called for a mass defense of the Holy Land. The artist shows the churchmen in robes and hats of the 15th century and has placed them in a Gothic hall with tall windows. The occasion was recalled with pride and nostalgia, since medieval people had no doubt about the rightness of the Crusades. (Jupiterimages)

Bourges, the count of Flanders, and many other landowning knights of the middle-rank aristocracy took the Cross.

A peasants' army also tried to join the Crusade and set off behind Peter the Hermit through Germany and Hungary. They were not successful in reaching their destination. Another small group under a German count massacred **Jewish** communities and were, in turn, defeated before they neared the Holy Land. But the main body of Norman knights reached Palestine. They captured the main cities of Antioch, Tripoli, Acre, and finally Jerusalem in 1099. They set up the Crusader kingdoms in the region they called Outremer, which meant "over the sea." The prince of Antioch, the count of Edessa, the count of Tripoli, and the king of Jerusalem were all created from among the Frankish lords.

The Crusader kingdoms sustained the Frankish nobility for 90 years, until 1189. At that time, a dynamic Arab general known as Saladin successfully defeated the king of Jerusalem and his Frankish allies. He reentered Jerusalem and quickly seized the remaining cities of the Palestine coast.

The Second Crusade, led by King Louis of France, had come and gone in 1148 and had ended with a defeat at Damascus. The Third Crusade began

in 1190 with the intent to restore the Holy Land cities to Crusader control. King Richard I of England, King Philip of France, and large numbers of the nobility of Europe joined in a procession toward Antioch. The king of Germany, who was also crowned Holy Roman Emperor by the Pope in 1155, also joined them. His name was Frederick Barbarossa (Red-Beard), and he had gone on the Second Crusade as a young man. The army massed by these kings and barons was the largest army yet seen in Europe.

After defeating Saladin's nephew in a battle in Asia Minor (Turkey), King Frederick drowned while crossing a river. The duke of Austria and the count of Thuringia led the remaining German knights to Acre, where the kings of England and France, with the archbishop of Canterbury and the counts of Champagne, Blois, and Clermont, joined them. The Crusaders were victorious at Acre, but King Richard threw down the banner of the duke of Austria, which caused a serious offense. Both the Austrian duke and King Philip of France went home; King Richard remained as supreme commander. The Crusaders took the cities of Jaffa and Ascalon from the Muslims but could not break a stalemate with Saladin. Jaffa changed hands several times, and Jerusalem remained in Muslim control. Richard finally negotiated a truce with Saladin in 1192: the Christian nobility kept control of coastal cities, Christian pilgrims could visit Jerusalem safely, and the truce would last for five years. Although King Richard's progress home was slowed by captivity in Austria and Germany, the Third Crusade was over.

The Fourth Crusade was called to regain Jerusalem, and it was led by the counts of Blois, Champagne, and Flanders. In 1201, they headed east. Although the shipping powerhouse of Venice promised to take the Crusading armies to the Holy Land, the Crusaders could not make the full payment. The doge, ruler of Venice, proposed that, as partial payment, they might help attack the competing port of Zara. Although the Crusader leadership could not agree on this, they did sack the city of Zara for Venice. A Byzantine prince approached them with a request to attack Constantinople in order to put him on the throne. While some of the Crusaders quit, the rest attacked Constantinople. The new emperor was murdered a few months later, in 1204, and the Crusader army again attacked the city and took control. They looted Constantinople, although it was a Christian city and capital of the Eastern Roman Empire. Treasures, **gold,** and holy **relics** were carried off. The Fourth Crusade ended with the count of Flanders crowned emperor; Venetians seized coastal **cities** and islands and took over half the city, and Frankish knights took control of most of Greece.

The Fifth Crusade was called in 1213 by Pope Innocent III, but it was disorganized. King Andrew of Hungary arrived in Palestine in 1217, helped build a fortress near Haifa, and returned home. Pelagius, the Pope's representative, led an army of bishops, French counts, and English earls against

Egypt in 1218. They occupied the Egyptian city of Damietta and waited for the German emperor's arrival, but instead, a smaller army came with the duke of Bavaria, and the Egyptians met their advance and defeated them by opening floodgates so that the plain became a lake. The Fifth Crusade, led by a papal legate with no military experience, was a complete failure.

A few years later, in 1228, the German Holy Roman Emperor Frederick II fulfilled his earlier vow to go on Crusade. Raised under the guardianship and tutoring of Popes, Frederick had become very secular and irreligious. The emperor's expedition became the Sixth Crusade. When the Pope excommunicated him en route, he simply kept moving and carried out his mission without the Pope's permission or blessing. In Acre, he kept up a friendly correspondence about philosophy with Sultan al-Kamil of Egypt, Saladin's nephew. Neither wanted war; eventually the Sultan returned Jerusalem to the Christians without a battle and agreed to a 10-year truce.

In 1244, Khorezmian Turks, hired by Egypt against a Crusader-Damascus alliance, took Jerusalem. The defensive force of Christian knights was destroyed when the army of Damascus deserted the battle. The Seventh Crusade was an attempt to take back Jerusalem again. In 1248, King Louis IX of France marched with his brothers, vassals, wife, and children toward Palestine. He landed at Acre but recaptured the Egyptian city of Damietta in an attempt to secure Palestine from Egyptian threat. His army was badly defeated and also suffered from dysentery. Louis remained in Acre for another four years, as the de facto King, and then returned to France with his family.

The Eighth Crusade also involved Louis IX, but it was preceded by two major changes in regional power. These changes marked the end of a Christian or Latin kingdom in Palestine. First, during the Seventh Crusade, the sultan of Egypt was overthrown by his slave army, the Mameluks. Second, the Mongol Tartars began their push into the West. A Mongol army sacked Baghdad in 1258 and then took Damascus and Aleppo. The Mameluk sultan met the Mongols near Nazareth with a large army and defeated them. The Egyptians proceeded to take all the Christian fortresses in the region, except for Acre. King Louis IX again took the cross in 1267, and his army sailed to Tunis, where they captured Carthage. Before they could continue to Egypt, the king died in 1270, and the Crusade ended. Krak des Chevaliers in Syria, the largest Crusader **castle,** fell to the Mameluks in 1271, and the Christians now held only a few coastal cities.

The last Holy Land Crusade, the Ninth, was short. Prince Edward of England, later King Edward I, led a small force to Palestine and succeeded in achieving a 10-year truce with the Mameluk sultan that protected the city of Acre. However, the Mameluks were not content with partial domination of the region, and, in 1287, they took the last port of the former

The best-preserved Crusader castle is Krak des Chevaliers in Syria. The outer walls' final form belonged to the conquering Turks, but the inner towers and buildings are entirely European. Gothic arches support a chapel roof and simple stone tracery outlines windows in the great hall. The very large castle was like a small town within the walls. (Steve Estvanik/Dreamstime.com)

principality of Antioch. In 1288, they broke a truce and secretly attacked Tripoli, razing its city and fortress to the ground. In 1291, the fortress of Acre gave way to siege tactics that collapsed its main defensive towers, and the city was abandoned in chaos. The remaining Crusader fortresses soon followed, and the Crusader kingdoms were no more.

European Crusades

While the Holy Land Crusades were the most important and prominent, Popes declared other Crusades. First, they gave indulgences to anyone who would help fight their European military foes. Then, beginning in 1208, there were full-scale Crusades fought entirely within Europe. The name *Crusade* became less relevant as the goals became less justifiable. The idea of a holy war came to mean any military action supported by the Pope, with no connection to the safety of pilgrims.

In 1208, Pope Innocent III proclaimed a Crusade against the Albigensian (or Cathar) believers of southern France, in Provence and the county of Toulouse. A representative of the Pope had been murdered in the region, but the growing strength of the Cathar region had been a concern for

some time. The count of Toulouse governed independently from France, and many Albigensians had fortresses and walled towns. A large army led by England's Simon de Montfort and the abbot of Cîteaux invaded Toulouse. They besieged towns and were often indiscriminate in their slaughter. In the town of Béziers, most of the inhabitants were killed, both Roman Catholics and Cathars. The region's culture and military strength were broken, and the count of Toulouse willed his territory to France as part of a peace treaty.

Even before this, German knights proclaimed their own Crusades against the still-pagan people on their eastern borders. Beginning in 1147 against the Wends, they conquered and converted the Prussians, Livonians, Estonians, and other now-forgotten groups between Germany and Poland. Swedes, Danes, and Poles sent troops at times. Other Crusades led by the Teutonic Order of Knights defeated the Stedingers, a group of excommunicated Frisian farmers, and tried to attack the Eastern Orthodox nation of Russia. The Pope supported some of these endeavors with official proclamations.

Beginning in 1420, Crusades were proclaimed against early Protestant reformers in Bohemia. They were followers of Jan Hus, who was convicted of heresy and burned by a church council in 1415. The First Bohemian Crusade, led by a would-be king of Bohemia, ended with the Hussites triumphant and in control of Bohemia. With the Pope's backing, German princes launched several campaigns against the Hussites, and each one was termed a Crusade. In 1436, the new king, Sigismund, and the Hussites signed a peace treaty that agreed to some reforms of the Catholic Church in Bohemia. The Bohemian Crusades were not similar to the original Holy Land Crusades; they were both a civil war and a precursor to the wars of the Reformation in the following century.

The Influence of the Crusades

At their peak, the Crusader kingdoms maintained five large ports in the Eastern Mediterranean: Tripoli, Haifa, Acre, Tyre, and Beirut. Before the ports were reconquered by Muslim troops in 1291, they were centers of trade between the West and the East. They served as points of contact with Africa and Asia. Traders from as far away as the Himalayas and China brought jewels and porcelain. The number of goods available in Europe (to those who could afford them) skyrocketed during the time of the Crusader kingdoms.

Beginning with the nobility of the First Crusade, Europeans intermarried with Byzantine Christians and Arabs. They learned Arabic and Greek and took up new customs. The nobility of the Holy Land sent daughters back to Europe as wives of kings. The Western and Eastern cultures began

to mix more. European identity itself widened and began to include the far-off lands that had formerly been considered Byzantine. There was a growing exposure to new ideas.

Crusaders started new styles in **armor,** such as wearing a surcote over chainmail. They marked themselves with the cross, the original design of some of Europe's modern flags. They were further influenced by Eastern styles that were more suited to the hot weather. The turbans and robes that came back to the heartland of Europe changed high fashion and brought in more flowing sleeves and longer trains.

By coming into contact with Byzantine fortress-building techniques, the Europeans carried home methods and plans for building large stone castles. Their castles in the Holy Land were among the best and most famous medieval castles; the ruins of many still stand. Their castles were not just around Jerusalem, but held strategic points in Lebanon, Syria, Moab, and Asia Minor (modern Turkey). Masons who traveled with the kings and knights came home with new architectural ideas. Eventually, **masons** began using the pointed arch they had seen in some Eastern buildings, which permitted the Gothic building revolution.

The monastic fighting orders began in the Holy Land. The Knights of the Temple became the record-breaking charity of choice for European nobility, since giving to the Templars seemed to guarantee forgiveness for sin. The Templars' wealth enabled them to become the bankers of Europe, a step toward international finance. Similarly, the Crusaders' close ties with the sea-based powers of Venice and Genoa drew trading and banking within Europe more closely together.

Financing the Crusades proved ruinously expensive to the noble families of Europe. Although trade increased, they did not directly profit. Both in donations and in land pledges for cash advances, the Crusades greatly increased the land holdings of the Catholic Church. Fund-raising by the First Crusade's nobles increased centralized royal power because some sold cities to the king. Fund-raising by later Crusading kings developed new forms of taxation and new structures of bureaucracy to collect these taxes.

See also: Armor, Banks, Monasteries, Ships, Weapons.

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D

Dance

Not much is known about medieval dance. **Paintings** show people dancing, but they are still pictures. Nobody wrote down detailed descriptions of dances, and letters rarely mention even the names of dances until after the Middle Ages. We have detailed **records** of Renaissance dances, but we can only conjecture about most medieval dances. We know that they danced at **weddings,** at **feasts,** and at **fairs.** We know that both the powerful and the peasantry danced.

Peasant folk dancing appears to have been continuous since early times, but many dances still practiced today are not as ancient as the Middle Ages. However, there is no question that most have some roots in the Middle Ages and that we can learn something about folk customs then by observing now. Paintings showed folk dances, especially during the Renaissance in Flanders, such as in the works of the Breughels. Other regions, like Spain, had rich folk dance traditions that are unrecorded and lost.

The chief form of medieval dance was the carol. It was sung and danced in a large group, holding hands or linked at the elbows. The song leader sang out verses while the dancers sang a repeating refrain. Carols were celebratory and joyful, and they may often have been bawdy. The carol was danced in two different forms.

In the farandole, which was more popular in Provence and Italy, the dancers held hands in a line, and the leader led them on a wandering path. It was always held outdoors and could be in a **garden** or a town. One traditional figure is called "threading the needle." The leader and the second dancer form an arch, and the line travels through it until the dancers forming the arch duck under their arms and join the back of the line. The third dancer is now the leader. Another figure is the snail in which the leader forms the line into a coil and, at the center, forms an arch for the line to pass through. The dancers might also form a series of arches for the leader to pass through and then form a line again. In the farandole, the steps were simple because the line was moving; dancers alternated between skipping and walking.

In the round, also called the branle, the dancers held hands in a ring, with the song leader in the center. They circled, moving alternately right and left; the name *branle* comes from a French word meaning "to sway." The steps probably varied with the song but involved something like a step to the left, to the right, to the left, and then a hop and kick to move one step right so the circle slowly rotated. This carol could be danced outdoors or in a hall at Christmas. It was the common form in France and England. However, both farandoles and branles were used all through Europe, depending on the occasion.

The estampie was a dance created by the Provençal **troubadours** during the 12th century. We know little about its form, and some scholars challenge the idea that instrumental songs called estampies prove there was a dance with that name. However, it seems most likely that there was a dance and that it was not for a line or a ring, but for two people—a **knight** and a lady. The steps were probably the same as for the branle, and the musical units were the same. While the carol's music could repeat endlessly, the estampie had a set form, with a beginning and an end. The steps probably varied with the changes and repetitions of certain musical rhythms or melodies. The two dancers were free to move left or right, or forward or back. It was a more refined version of the folk dance and was performed at court or in halls for others to watch.

After the **Crusade** against the Cathars, which destroyed Provençal society for a long time, many troubadours fled to other regions of Europe: Italy, Germany, France, and England. The estampie spread and became the point of origin for later medieval and Renaissance dances. Some versions of the dance, such as the estampie gai, required the dancers to spring from foot to foot, not high but very quickly. Dancers stood side by side at times and at times face to face. They moved side to side and forward and back. It was a memorized set of figures, and dancing it required attention and skill, not just movement as in the farandole and branle. The sets of steps were termed simples, doubles, and reprises.

The development of the side fireplace, replacing the central hall hearth, allowed the hall to play host to both **drama** and dance during the 14th century. The shape of the hall, with a central area for dancing, encouraged dances to evolve into lines or sets of pairs so that dances could move up and down the hall's length. When the dancers were in front of the dais, where the lord sat, they bowed or curtseyed, a custom that continued into the 19th century. In warmer Italy, houses were organized around a central courtyard, and rooms were smaller. Italian dances were usually figure dances within smaller spaces, unless they were outdoors.

During the 14th century, a new dance style developed in Germany. Germans called it the trotto, and Italians called it the saltarello, but in most other regions it was called the almain (English) or allemande (French), which meant a German dance. The dance used the steps of the branle but with couples in a procession, moving forward. The basic dance figure had each couple step forward with the left, turning slightly, then the right, then the left, and then hop on the left and raise the right knee. The allemande may have moved to England following a 1338 visit of King Edward III to the court of the German emperor, where the English party may have seen or participated in it.

The almain as recorded in Elizabethan times stated that the couple must hold hands, facing each other. They step to the left, circling with the dance

By the 15th century, dance fashions required couples to move about the room in a prescribed way. The music gave them cues for which sets of steps were required. When each couple reached the high table, where the host was seated, they bowed. Although choral music used harmony by this time, instrumental music lagged behind. Dance music was most often produced by just a few instruments; a single instrument, here the flute, carried the melody. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

steps to change places, and then step to the right, circling back again. Then the gentleman lets go the lady's right hand, and they move to stand side by side, with the center joined hands raised. They move forward with four sets of the dance steps. Then they join hands and circle again. Couples move toward the dais of the hall this way.

Dance began to develop into two parallel customs, the peasant folk dance and the formal court dance. The branle had been both at the same time, and it continued to be danced in both spheres of society, but its steps became more complicated. From this time on, dancing masters were employed to teach young courtiers the steps, since the sets had to be memorized. So many singles, so many doubles, turn and reprise, then doubles again, and so on. One influence may have been the growing complication and weight of **women**'s dresses, which had long trains in the 14th and

15th centuries. A ring dance with a hop was difficult to execute in such a dress; ladies had to tuck their trains over their arms. Formal court dances that focused on movement in processions up and down the room were more practical. These dances emphasized the correct execution of precise movements, like a modern line dance.

In the 15th century, the basse dance developed in France. *Basse* meant "low," and scholars are divided as to whether this referred to steps with less hopping or to a low, peasant origin. It appears to have begun as a country dance, but it was a formal court dance. Music for the basse is based on a count of three. Steps were based on the branle and estampie figures, but with more variation. The motions required rising onto toes, stepping forward or back, raising a foot, and sometimes springing slightly into the air. Steps were grouped into measures, short patterns that combined the motions and changed with the music.

The dance was planned so that couples stood in a line down the center of the hall and, as they turned, exchanged places, faced each other, and faced the front; they gradually progressed to the top of the hall. This action came to be known in English as a set, and the couples would move to "the top of the set" and then take their place at the bottom again. In a crowded room, couples could wait in line to join the set as it moved along.

As Italy's culture moved from medieval to Renaissance in the 15th century, Italian dancers further refined the basse. The focus was on small, graceful motions in which dancers rose on their toes and sank down again or turned their body in a direction opposite the motion of the foot. The first was called an aiere, and the second a maniera. Combined, the two motions formed a movimento, in which dancers rose on their toes, turning their body and staying in place.

The emphasis in dance was no longer on the rowdy fun of skipping in a line through the garden, threading the needle while singing a carol in unison. Formal court dances required small orchestras, and in the baroque period of the 17th and 18th centuries, many of the greatest composers wrote dance tunes, including allemandes and basses. Dancing masters taught the steps and invented new forms. Skill in dancing meant leaping, springing, turning, and bowing with the gracefulness of a tree bowing in the wind. It also required perfect execution of the memorized steps and knowledge of how to interpret cues in the music.

Folk dancing continued to be part of peasant life. Peasants at fairs still danced farandoles and branles for several centuries. On May Day in England, peasants wore pieces of greenery on their heads and danced around a maypole. Paintings of these occasions show a line dance, perhaps in a ring, with some holding their feet high to stamp down in time to the dance; it is clearly the branle dance. Music could be as simple as a single piper or flute

player, but many folk dances continued to be sung as unison carols. Some of these old carols persisted as Christmas songs, since round carol dancing was a **holiday** tradition in many places, including England. "Deck the Halls" is a Christmas carol that preserves the carol form. The leader sang, "Deck the halls with boughs of holly," and the dancers joined in, "Fa la la la la, la la la la."

Morris dancing evolved in England out of mumming, a primitive drama tradition. Mumming often used a sword dance, and a mumming drama of fighting a Moor seems to have developed the motions of the dance. In Morris dancing, the dancers wear festive costumes and use steps similar to the ones from the estampie, moving forward and backward. They carry wooden batons and rhythmically cross these swords with each other in time to the music.

The idea of dancing was loaded with symbolic meaning after the trauma of the Black Death **plague** during 1347–1350. Up to one-third of the population had died, and, 10 years later, a second wave of the plague carried away many small children. Living had never felt so uncertain, and death had never felt so random and sudden. The Dance of Death was a common image in art. Death was shown as a merry skeleton who swept dancers into a farandole that led them away, unwilling. Nobody got to choose whether to join Death's dance; Death seized hands and pulled them into the line.

Post-plague society even acted out this symbol in the strange Dancing Mania epidemic. Beginning around 1374, townspeople were drawn into frenetic, nonstop dancing in public. The dance was almost certainly in a ring, with the steps of a branle. The dancers went around and around, skipping and kicking, until dark and on through the night. They felt unable to stop, and many gradually died of exhaustion or heart failure. As they danced, some screamed out that they were seeing visions. At the time, people considered it a form of demon possession. The only attempted cure was to take charge of the hysterical dancing with music and to play the music calmer and slower until the dancers came to rest.

In the 19th century, Justus Hecker, a German doctor, researched the phenomenon and tried to solve it as a medical mystery. It is possible the dancers were suffering from ingesting ergot, a toxic fungus that grows on rye. Ergot grows more in damp seasons, and the 14th century had unusually damp weather. The fungus has some hallucinogenic chemicals, including lysergic acid. Ergotism causes painful spasms and hallucinations, but it does not cause dancing. While it is possible ergot toxicity was part of the problem, making the people less rational, there seems to have been a large measure of psychological suggestion causing mass hysteria.

See also: Drama, Holidays, Minstrels and Troubadours, Music.

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Dragons. *See* Monsters

Drama

Solid information about drama in the early Middle Ages, and outside England, is difficult to find. We know the **church** sponsored dramas that illustrated Bible stories or religious themes for illiterate audiences, but we have few records of such dramas on the continent until late. The first pageant recorded in England was acted in 1100. The earliest evidence of plays outside England comes from the town of Arras, between France and Flanders. There seem to be separate European drama traditions, both secular and liturgical, that came together to produce the iconic medieval mystery plays.

A few elements seem universal in medieval European drama. **Women** never took roles, and both boys and men played the roles of women. Costumes and staging were important; drama used props, backgrounds, and even special effects. Drama was often a fund-raising event, raising money from sponsors and spectators. Most regions only put on one, or at most two, plays each year because they were so much work. People traveled to a specific place to see its play, which was always held at a certain **holiday.**

Secular Folk Drama

Pagan culture almost certainly involved some ritual playacting, particularly to celebrate harvest and spring. Some of these traditions can be seen dimly in folk dramas. These performances seem to have included elaborate costumes, often with **animals'** heads, and the story as enacted often involved a ritual mock execution. It may have begun as an enactment of the death of the year at winter and its rebirth in spring.

Mummery was traditional in England at the New Year and at Shrovetide's Carnival festival. Similar drama and dances also occurred in Germany and other parts of Europe. The English pantomime horse costume, with one or two people acting as a horse's legs, developed from the mummery tradition in which there also might be actors with stags' or birds' heads. There was no scenery or formal stage; the play took place in a street or hall, with only the costumed actors and their mock swords or other simple props.

Mumming dramas typically followed a set pattern of story, such as it was. A presenter began with an explanation of the characters and the action, and the character of the presenter changed with the season, from Old Man Winter, to Fool, to Beelzebub the Devil. He called out a champion, usually Saint George, to fight an enemy, usually some kind of Turk or Moor, a holdover from the **Crusades.** The champion always won, and the enemy was killed. Then the mummers brought on a doctor to cure and raise the dead man. A final **dance** was performed while the players passed a collection box among the spectators. This form of mumming led to Morris dancing, a mock swordfight dance that has continued among folk dancers into the present.

Mumming was called a visitation because the mummers arrived from another village or another side of the town in masks and costumes to disguise their identities. They altered their costumes and play for the time and occasion and did not always act out the ritual execution. In the 14th century, King Richard II was visited by a group that included popes, cardinals, and African princes carrying gifts. It was during the Christmas season, so the mumming imitated the Magi whose Feast of the Epiphany closed the season. They played mumchance with loaded dice as an excuse to give their gifts to the king as he won them, and then they performed a dance and left. Another late medieval Christmas mummery, put on by the goldsmiths' guild, represented King David and the 12 tribes of Israel and carried the ark of the covenant. Mummers sometimes invented their own fun, as did the 15th-century group who dressed as grotesque peasants and presented marital quarrels to King Henry VI to arbitrate.

The seasons of mumming could be a problem for civic order, since people drank too much and sometimes acted violent while wearing masks. Some of the criminal class used mummery as an excuse to commit crimes while in costume. The church did not approve of mummery, which was clearly not based in Bible or **saints'** stories, and tried to suppress it. Its traditions lived on, even after the Reformation, in costume balls called masques among the aristocracy, in the pantomime drama tradition of Christmas, and in Morris and other folk dances.

Another informal form of drama was the simple pageant. **Guilds** were fond of staging pageants for great occasions such as the coronation of a king, the installation of a new mayor, or any other grand occasion that brought

someone powerful into the **city** neighborhoods. The simplest form of a pageant was simpler than a full drama. In a pageant, costumed actors on a stage created a tableau, a scene from something well-known. It could be a Bible story, a scenario with Roman gods or heroes, or an allegorical scene about Victory or Virtue. From the stage, the actors addressed short congratulatory speeches or songs. While most records of such civic pageants come from London, other countries in the later Middle Ages staged similar pageants, and they may have been common everywhere.

Another folk drama in late medieval England was the May Day tradition of acting out stories about **Robin Hood** and Marian. By the 15th century, there was a cycle of stories about Robin and his band, including Marian, Friar Tuck, and Little John. Marian was merged into the mythology of the May Queen so that it became a strong tradition in the countryside.

Interludes were a late medieval development; they were short plays that came between stages of grander entertainment. Interludes were often enacted by a great household's **servants** who had some skill with singing, juggling, dancing, or acting. They could be short plays with a moral or other forms of entertainment. As a form of entertainment at court, the interlude outlasted the full-scale miracle or mystery play, and the term came to mean any sort of stage entertainment of a light sort, especially as comic relief between weightier matters.

Religious Drama

Religious drama began with stories presented in **music** and song in church. At first, stories were presented by being sung in responses between two choirs or soloists. Then, churches began to use more acting; monks played the parts of people in the Bible stories, although they stood still in the choir and merely sang the lines in Latin. By the 10th century, on Easter morning, monks playing the part of women seeking the tomb of Jesus entered through a side door. They sang lines to a monk playing the role of the angel, who answered them. A sepulcher box stood at the front of the church, by the altar, and the priest could bury a crucifix in it and resurrect it on Easter morning. At Christmas, a crib stood at the church's altar so monks could act out the arrival of the Magi. As time went on, these dramas became more realistic, although they continued to use only the melodic lines of the liturgy, as in opera. Real animals might be included; Francis of Assisi later staged an outdoor reenactment of the Christmas story, with a stable and animals, for his town in Italy. The first long musical church service that crossed into true drama was *Adam and Eve,* a play about the temptation and fall into sin of the first man and woman and how one of their sons murdered the other.

In the 12th century, the productions grew and moved outside into the churchyard to permit more people to watch. Among other motivations to move outside the church building was that the priests and monks chose to stage presentations of Bible stories about wicked people, and they needed to act out the behavior of the wicked. This was not suited to the Mass, and it was likely to be noisy and make the people laugh. Another key change was that since the drama did not need to be part of the official liturgy, it could be in the vernacular—the language spoken by the people. For the first time, the official church began to teach directly in the people's language.

The new drama tradition included both mysteries, meaning Bible stories, and miracles, meaning stories about the lives of the saints. The longest plays showed many scenes from the Bible and might portray the entire history from Creation to the Last Judgment. They might show scenes from the life of Jesus. Passion plays, first developed in Italy, focused on the death and resurrection of Jesus.

There are many saints' plays in French that illustrate miracles after a saint's death more than scenes from the saint's life. These were probably put on to honor the saint and promote the shrine where the saint's **relics** could be viewed. Many saints' plays also include lengthy torture scenes and must have been popular spectacles. The holiest of saints could be killed repeatedly, but, due to their holiness, they did not die, so death scenes could go on and on, with the saints burned, drowned, frozen, and beheaded. The saints had defiant, resolute replies to their tormentors. In a society that valued bearbaiting, the torture and death of a saint was good theater. Saints' plays seem to have been especially dominant in Italy and Spain, where the cult of venerating saints was even more intense than in Northern Europe.

During the 12th century, the popularity of mystery and miracle plays grew, and laymen took over producing the plays. Trade guilds often undertook to put on a series of pageants. They often chose a theme related to their craft. In 1400, the craftsmen of Avignon put on a passion play for three days at Pentecost. It involved 200 actors and was viewed by around 10,000 people in stands. The town of Arras, on the border of Flanders and France, staged many large spectacles. Still, most of the remaining evidence comes from England, where many pageants took place, and we have descriptions, scripts, receipts, and rolls of participants' names to help form a clear picture of what went on.

Next to Christmas, the most universally recognized date for staging a major drama was Corpus Christi Day, a new feast announced in 1264 to honor the death of Jesus in a general way. The date was dependent on Easter, so it was a movable feast, but it always fell at the end of May or during June. The weather was good, and the spring planting was finished. Since the day was not dedicated to any particular saint or Bible story, towns and

Medieval drama used as many special effects as possible. When a play was on a permanent stage rather than a wagon, much more was possible. Fire and water effects were very popular. In addition to showing how fire and smoke effects could be handled, the artist has suggested ways that sound effects could be achieved with a large drum or a noisy barrel. Costumes were an important part of the spectacle. Costumes were almost never authentic in the way that modern drama requires; if the audience understood who the character was, it didn't matter if a Bible figure was dressed in a contemporary way. All women's roles were played by men and boys. (Private Collection/© Look and Learn/The Bridgeman Art Library)

guilds could honor it with any religious drama that seemed grand and general enough. In June, the hours of daylight were the longest of the year, and a very long, grand drama could be put on from sunrise to sunset, and even an hour into the night, if the stage could be lit.

There were two kinds of outdoor productions. One form of staging was a moving spectacle that snaked through town in a procession of stages on **wagons.** These plays were called cycle plays because they were broken into parts that followed a common theme and told the same history. The other form, probably less common, was a group of stages, called scaffolds, in a semicircle. The town that used this type of staging set aside a field for holding their annual drama and either built permanent scaffolds or kept movable scaffolds in storage, perhaps in guildhalls.

In a moving procession of pageants—a cycle—each guild took on a different pageant's production. The Corpus Christi cycle of York told the Biblical history of the world, from Creation to the Last Judgment. Each guild covered a scene: the creation of the world, the creation of man, the fall of man into sin, Noah's ark, Moses receiving the Ten Commandments, and so on. The first wagon's drama began at dawn and repeated through the morning until it reached the end of the route. The last wagon made its journey through town at the end of the day and reached its last station after dark. Some stages required trap doors or curtains, and some were two or even three stories above the wagon. The Last Judgment required hell, God's throne, and angels in heaven, so it had a third tall deck high above the street.

The wagons were not standard farm carts but were built for each stage. The stages may have been square or oblong; some faced to the side, and others faced to the back so the stage stuck out into the crowd. There was always a three-sided structure sheltering the stage. It could be the stable of the nativity story or a desert backdrop with stars. Animals needed for the action were built of wood, cloth, or wicker and were designed to have one or two people inside moving them or making them speak. Some stage wagons may have had special effects of water or fire. As evening came and the last stages performed the end of the world and the Last Judgment, a darkening street could have been lit by fireworks or lamps to show the **lights** of heaven or hell.

In a stationary outdoor production, there was an open area called the place and a set of scenes called scaffolds. Medieval productions did not change the backdrop of the same stage, but rather moved the action to a different scaffold when the story went from castle to desert. The empty area—the place—may have been for actions in between the scaffolding, or it may have been an area for the spectators to stand as they followed the actors from stage to stage. Scaffolding that was not limited by the size and stability of a cart could be even more elaborate. Medieval stages, custom built, included doors, trap doors, ladders, curtains, and upper decks.

Plays were staged indoors toward the end of the Middle Ages. They used the great hall of a manor house, **castle,** or guildhall. The great hall always had a central fireplace, sometimes still in the center of the floor rather than at the side of the room. At the far end of the hall, a raised floor held the lord's seat and table. This dais was the earliest indoor stage. Indoor plays most often took place during Christmas, most of all on Twelfth Night, the close of the season. The other season for plays was Carnival, or Shrovetide as it was called in England; both seasons were cold enough that indoor drama was more convenient for all.

Indoor plays took place after dinner or between a meal's courses. Plays acted with dialogue and story may not have used much scenery, but a popular kind of pageant was dependent on elaborate scenery. In this kind, a curtain fell back to reveal a tableau that showed a scene, and it was all about making it the best spectacle possible through painted scenery, props, and costumes. A wooden castle, ship, or mountain on wheels would become the setting for a short scene to be played, sung, or danced by players who could even be concealed inside the piece.

In all three settings for medieval drama, the acting method sometimes used the audience as part of the story. There was no clear division of stage and audience, as in a modern theater, and the lighting was the same in both places so that the audience did not sit in secluded darkness as in a modern production. In a street play acted on a wagon, some players would walk through the crowd and join the play as disciples joining Jesus or devils

coming to tempt the soul of Man. Some actors would jump off the stage and run into the crowd while the others called out, "Stop him! Don't let him get away!" In some plays, the actors turned to the audience to explain the action or gestured to the crowd as witnesses to what they had said or done. When a Bible story was presented, the play often took liberties with the literal story and added comic characters.

Towns in East Anglia put on single-performance plays, usually on religious themes. These plays were not staged by guilds or in manor halls, but in towns, and were put on cooperatively by the parish. They combined a performance with a large community feast, and they were fund-raising events that tapped donors for subscriptions. Plays might benefit the parish church, perhaps to put on a new roof. People from surrounding towns and villages traveled to see productions. These plays were written locally, and the manuscripts were sometimes copied and rented to other communities. The region of East Anglia had so many local plays put on by small communities that some men began to specialize in stage production and became semiprofessional theater managers who could be hired temporarily.

Allegorical Drama

Medieval plays did not divide only between religious and secular, but also between story and allegory. While a religious story might present the life and martyrdom of a saint, a religious allegory would portray ideas represented as people. The characters' names were abstract ideas, such as Worldliness or Temptation, and their actions demonstrated concepts about sin, the soul, and how to live a good life. These plays are best known as morality plays. Surviving manuscripts date from end of Middle Ages—the mid-15th century—so we can't know how early these plays were performed in the same form. It is likely that they were fully developed during the 14th century.

While there are fuller **records** of morality plays in England, there is evidence that similar plays were valued in other places. In Bavaria, there was a play about the Antichrist with allegorical figures representing Heresy, Hypocrisy, Mercy, and Justice, who do physical battle. One well-known play, *Everyman,* was translated into English from Dutch. The Netherlands had a guild of rhetoricians who held competitive drama festivals. The original *Everyman* was written for a festival in the 1490s. Everyman is getting ready to die, which is staged as going on pilgrimage, and needs companions to accompany him. Most will not go with him, including Riches, Kindred, Beauty, and Strength. Only Good Deeds and Wisdom will be with him at the end. Other morality plays featured the seven deadly sins as characters.

The most famous English morality play is *Mankind*. The main character is called simply Mankind, and he represents a generic human being. Mankind is a simple farmer, watched over and taught by the figure of Mercy. He is trying to hoe his field, but Temptations come and try to distract him from his work. The leader is called Mischief. Three minor temptations act as clowns, and at one point they make the audience since a bawdy song with them. Mischief brings up a devil, who makes the ground as hard as a board so Mankind cannot dig in it. Mankind eventually falls away into sin, but Mercy rescues him.

In another famous morality play, *The Castle of Perseverance,* the main character is again named Mankind. This time, he is a noble lord who must defend the castle against forces of evil with the help of the seven Virtues. His castle is attacked by the Devil, the Flesh, and various temptations, but he resists them all. Mankind then listens to Covetousness and leaves the castle in pursuit of riches, but he dies. His soul goes to hell, where it is rescued by the four Daughters of God (Mercy, Peace, Righteousness, and Truth).

The existing manuscript of *The Castle of Perseverance* includes a sketch of its staging. It shows a castle in the center, with a ring of scaffolds for various scenes of action. The picture suggests the audience stood outside the ring, with marshals posted around to keep them out of the stage zone. The best productions may have dug a moat around the stage circle, filled with water, so that the water could be used at some points of the action.

The play *Wisdom* must have been aimed at a more intellectual audience, perhaps at court. The soul, Anima, is the main character, and the others are more abstract. Allegory was an art form in medieval literature, and educated audiences expected that characters would be abstract representations.

Most play scripts have been lost over time. The difficulty of recovering these texts is illustrated with *The Pride of Life,* a morality play about the King of Life, who cannot bring himself to face Death. In a monastery in Dublin, a portion of this script was discovered copied onto the back of a roll of accounts from 1347. The original has never been discovered, nor have any other copies. Many church **libraries** were destroyed when King Henry VIII closed the **monasteries** and during the following religious civil wars.

The traditions of drama broke down during the Reformation, but some remained continuous. In England, drama remained a key part of school life. Most **schools** produced at least one play every year, perhaps in addition to Twelfth Night mummery. In regions of Europe that remained Catholic, such as Spain and Italy, the liturgical dramas to honor saints continued.

The Carité of Arras

The town of Arras, in Picardy, was a French-speaking town within the commercial environment of Flanders. It had an unusually active theater

community because the **minstrels** and jongleurs of the town formed a confraternity, a religious guild. They had an annual festival to celebrate their 12th-century miracle of the appearance of the Virgin Mary to two jongleurs. Mary gave them a holy candle whose wax could cure the disease of ergotism. The jongleurs named their organization the Carité de Notre Dame des Ardents and built a chapel for the holy candle, the Sainte-Chandelle. This gave the town's minstrels and actors a high social standing unusual for professional actors.

The annual festival included plays put on by the jongleurs. The jongleurs were literate, and some of their plays have survived in written form. While miracle play cycles developed a traditional form that repeated every year with little change, the jongleurs' plays in Arras were original compositions. They are among the few medieval plays that were signed by the authors, who, as professionals, wanted credit. These plays reached a level of dramatic sophistication that bridged into the later, early modern development of the stage. Although the main point of each play was always to call attention to the need to venerate the Virgin Mary and her candle at the Carité's chapel, the play's action could use anything to draw a crowd.

One play began with a man announcing to the crowd that he was leaving Arras to take up musical studies in Paris. Other actors were planted in the audience and joined the action at the proper time to encourage or protest his decision. His sick father begged him not to leave, so a doctor emerged from the crowd to help diagnose the father's ailment. One by one, more characters emerged from the crowd and added plot complications. The plot wandered from interest to interest, closing with a group of fairies who put a curse on the original jongleur such that he could not go to Paris. The closing lines, addressed to the audience, asked them all to come and venerate the shrine of Mary.

A play like this represented a new stage in the development of drama. The actors, who were professional jongleurs, may have been playing themselves, and the lead actor may have been the author who signed the manuscript. The stage included not only its own scenery, but also the marketplace and surrounding buildings. Actors came and went in the crowd and may have changed costumes out of sight. The loose plot was not organized around a moral or a Bible story, but rather around local sources of comedy. The jokes used the names of real citizens of the town, teasing them in bawdy ways. As a device for gathering a crowd to go into the chapel, this play must have been very successful. Its secular nature, professional staging, and blend of artificiality and naturalness link it to the sophisticated drama of the Renaissance.

See also: Guilds, Holidays, Robin Hood, Minstrels and Troubadours, Music, Wagons and Carts.

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E

Easter. *See* Holidays

Embroidery

Embroidery was one of the few crafts considered suitable for upper-class ladies, including queens. Many convents set the nuns to work making embroidered altar cloths and vestments. Poor people did not have the resources for any but the simplest decoration, and the middle class probably added what decoration they could, dependent on their access to free time with adequate daylight and scraps of colored wool or linen yarn.

Embroidery was also a paid craft. Most extant fine embroidery from the Middle Ages was commissioned by patrons and stitched by professionals, both men and **women.** Decorative robes and hangings for use in churches were the biggest market for professional embroiderers. These ecclesiastical robes and hangings were heavily embroidered with scenes from the Bible or the lives of **saints.** Embroiderers were not a **guild** craft. They usually worked for a single patron or in a small network of craftsmen who could be called on to help execute large commissioned pieces.

The earliest embroidery did not survive well, since, by nature, it was on fabric. **Cloth** wore out, or garments were cut down and used in other forms until these had worn out. All that survives are a few garments in graves, and they are usually fragments. Pagan grave goods included **clothing,** but, most of the time, the fabric has rotted away. Only in the case of nobles who had ship or coffin burials do we find any fabric at all.

However, there is clear evidence that the earliest Germanic peoples decorated cloaks and dresses with embroidery. After they became Christian, they focused on heavily decorated cloths to cover the altar or for a priest to wear during Mass, and some survived in the keeping of churches. Tunics and mantles for the nobility, as well as even their **shoes,** were usually embroidered, often to a degree that astonishes our modern eyes.

Needles were made of **iron** or a **copper** alloy, such as brass. Ladies kept their different-sized needles in fabric needle cases. In the late Middle Ages, seamstresses began to use thimbles. They were very similar to modern ones, made of small bits of sheet metal with punched indentations to brace the needle. Thread was kept on bone or wooden reels and spools.

As early as the sixth century, we find evidence of the basic embroidery stitches used today: chain stitch, satin stitch, and stem stitch. Embroidery was practical, such as hemstitch or buttonhole, and it was also decorative. It was a way for people to make pictures with thread. They outlined leaves, **animals,** or even mythical or Biblical figures. Using a contrasting color, they filled in the shape with rows of chain stitch or satin stitch.

The importation of silk changed both the nature of embroidery and its ability to keep well over time. Silk keeps better than flax. Silk thread can be dyed brighter, and embroidery on silk is much finer than embroidery on homespun linen. By the 10th century, the embroidery found on robes and hangings for the wealthy was very fine work. By the late Middle Ages, white embroidery with drawn threads to create a lace effect was popular.

Gold thread was popular for the finest, most expensive work, often for royalty or commissioned by royalty for the church. Fine gold wire was wound around silk or wool the way **silver** wire is wound around a core to make a violin or guitar string. It was difficult to make, and gold thread eventually constituted its own craft trade, monopolized by women craftsmen. In some cases, after the embroiderer finished using gold thread, the piece was hammered to flatten the gold until it was smooth and shiny.

Pearls and gold ornaments were added to the most expensive pieces. Tiny pearls had holes drilled and were threaded, and then these threads were stitched in outline patterns. Gold ornaments either of thin gold leaf

Priests' robes and other ecclesiastical fabrics were heavily embroidered. In this painting of priests, each robe has been given decorative details. Some have embroidery on hems, sleeves, and collars, while others appear to have embroidered designs all over the fabric. Nuns worked on ecclesiastical embroidery, but churches also paid secular embroiderers to keep up with the great needs of the church for altar cloths and wall hangings. (The British Library/StockphotoPro)

or of thicker cast gold had tiny holes so they could be stitched on. By the end of the Middle Ages, goldsmiths were beginning to make something like modern sequins, small circles with a hole in the center.

Most medieval embroidery covered large areas, perhaps as repeated fleur-de-lis designs all over a queen's cloak or the royal lions on a warhorse's quilted coverings. The designs had to be seen from a distance, so while detail work was valued, visibility and the ability to fill in areas were even more important. One technique was to use backstitch, stem stitch, split stitch, and chain stitch to fill in large areas of color. These colored areas were usually outlined in black. Cross-stitch and brick stitch could also be used. These focused on counting threads to create little blocks of color forming a large pattern.

Another popular method of filling spaces was called couching the thread. Very long stitches laid colored threads vertically over the space to be filled. Horizontal threads were laid across these at regular intervals as if to brace the long vertical threads. Then tiny stitches held these horizontal threads in place. In the late Middle Ages, and on into the Renaissance, the small stitches that anchored the long threads began to be part of the design. Dark blue stitches anchoring couched gold threads could be clustered more heavily in places to create shadows in, for example, the folds of a saint's gold robe. This technique, called *or nué,* could give an embroidered picture the quality of a painting. Couching threads could also be done from the underside. The long threads, often gold-wrapped, were laid across the area, but a fine, plain thread ran along the underside. It caught the top thread and went down into the same hole, pulling the top thread slightly down with it. The thread on the underside was not visible on top. (Sewing machines use a similar method for their standard two-thread stitch.)

Large embroidered pieces, such as hangings for a warhorse, were often appliquéd with large pieces of colored fabric stitched around the edges. This saved time over having to create these large fields entirely in satin stitch or couched threads. Appliqué was especially practical when the pieces were made of fulled woolen cloth that did not fray. When using a fraying fabric like silk, they may have applied hot wax to the edges.

Professional embroidery for ecclesiastical or royal robes was often planned and sketched by an artist and then completed by the embroiderer. Sometimes, designs were drawn in charcoal or ink. Other times, a **paper** stencil had holes pricked in all the lines, and chalk dust was forced through the holes to leave an outline on the fabric. In other cases, the silk could be stretched on a frame with a **light** source such as a candle or window behind it. The pattern on silk or paper could be seen through it.

Frames for stretching fabric could be much larger than the small hoops commonly used by today's hobbyists. Since pieces could be very large, the frames were more like quilting frames. They could be held on trestles like

a table or propped up like an easel. The fabric was often pulled tight by cords that ran through the edges and around the frame, so it was not easily removed.

Quilting comes into the record only as a technique for making padded clothing. Quilted coats and tunics, for winter or to wear under armor, had long been made all over Europe. Quilting was a plain, undecorated technique to make thick material, rather than a decorative craft. Quilted hangings or blankets, with decorative stitching, were not common until after 1500.

The Bayeux Tapestry

The Bayeux Tapestry is the most famous example of early medieval embroidery. It is not a proper **tapestry** because the pictures are not woven. It is a wall hanging, but for that reason it has become known as a tapestry.

The Bayeux Tapestry belonged to the **Cathedral** of Bayeux, a city in Normandy. It was probably embroidered in England in the years immediately following the Norman conquest of England. The most likely patron is the bishop of Bayeux, the duke's half-brother Odo. It is a very long strip of linen with an embroidered mural showing the events leading up to the Battle of Hastings and featuring Odo as the duke's adviser at several points.

The Bayeux Tapestry uses wool embroidery to explain the Normans' justification for invading England in 1066. (ImagesEurope/StockphotoPro)

It is shorter than it originally was, but its current length is still just over 210 feet. It is less than 3 feet high. It probably hung at eye level in the bishop's **feast** hall and was later taken into the cathedral for safekeeping. Violence during the French Revolution nearly destroyed it, and it sustained damage, but conservators have been able to preserve it.

The embroidery is in woolen thread using only eight basic colors dyed in vegetable dyes. Most spaces are filled with couched threads. The effect is very regular, with the long supporting threads forming a neat row-like look. Details, such as lettering, lances, ropes, and the cross-hatching of chainmail, are in stem stitch. People and their garments are outlined in a contrasting color, but not always in black.

The main subject of the Bayeux Tapestry is the long story of why and how the duke of Normandy invaded England in 1066. The events leading up to the invasion, including a moment when the future king of England swore fealty to the duke while in Normandy, are shown in scenes along the panel, with narration above, "Here Harold took an oath to Duke William." The scenes go on to show the shipbuilding, the loading of equipment, the crossing of the Channel in open boats filled with **horses,** the building of forts, and the eventual battle. While the scenes do not always have realistic perspective and detail, at times they show details of daily life. The Normans are shown cooking outside before the battle and using their shields as tables.

The top and bottom margins illustrate fables or show strings of mythical or unusual animals and birds. At times the main scenes use the margins as extra space for **ships'** masts or dying warriors. There is rarely any narrative connection between the marginal illustrations and the mural's story, making it a very unusual choice in the plan of the wall hanging.

See also: Cloth, Shoes, Tapestry.

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Eyeglasses

Medieval **paintings** began to show simple eyeglasses during the 14th century. Although the invention of vision aids began the chain of inventions that led to telescopes and microscopes, not many people owned or used

Medieval eyeglasses were placed in simple, minimal frames without supports over the wearer's ears. They were not only uncomfortable to wear but also too expensive for all but serious scholars or other professionals who needed to read account books and see small details. Even so, to medieval people, such technology was next to a miracle. (San Nicolo, Treviso, Italy/The Bridgeman Art Library)

glasses. In medieval Europe, wearing glasses had a negative connotation in society. The only people who really needed to see so well were monks who copied books, merchants and their bookkeepers, and scholars. Medieval society admired, rather, **knights** and men of action, who had no need of lenses or **pens.**

Nobody knows for sure who invented the first eyeglasses. We know the invention took place around 1300, and it was either in Italy or in England. Roger Bacon wrote a lengthy treatise on his scientific studies at the Pope's request. *Opus Majus,* sent to the Pope in 1267, included a treatise on optics, probably based on Arabic treatises he had been reading in Latin. He described all the principles of the eye and of lenses and may have invented eyeglasses. On the other hand, in 1306, an Italian priest spoke in a sermon of how eyeglasses were one of the great wonders of the age and that they had been invented in Italy about 20 years before. Many traditional accounts gave the credit to a Dominican monk named Allesandro della Spina, who died in 1313.

Paintings dating from around 1350 depict monks and saints wearing eyeglasses or using magnifying glasses for their manuscripts. These early eyeglasses did not have a frame to support them using the nose and ears. There were two lenses in a frame, often hinged, and it only stayed on by clamping it on the bridge of the nose. The wearer often had to hold the hinged lenses in the right place with a free hand. Eyeglass frames that held the glasses to the face came later, during the 16th century.

A frame for eyeglasses was discovered in a London excavation dating to the 15th century. The frame is made of bone and is in two pieces. At the hinge point, they are riveted. It is possible that the two lenses could be aligned so that together they would act as a more powerful magnifying glass.

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F

Fairs

A fair was different from a town market. The market was a local, frequent event; it took place in a town center, often under a cross erected by the local church. The fair was an infrequent event; it was held once a year for a limited time, though some towns had more than one fair during the year. Some vendors made a living traveling from fair to fair, selling **animals** or wares they had made. Fairs were particularly important in outlying regions where traders did not often come. In Scandinavia, fairs were always in the summer, when travel was possible.

Traders from as far away as the Mediterranean Sea made regular stops at the large northern fairs to buy furs. In these far-off regions, towns that hosted even an annual fair became the business hubs that grew into **cities.** International trade at fairs brought many foreign words into the host languages, even in the Middle Ages. Arab traders gave Arabic words to Italian merchants, whose contact with the large northern fairs brought words like *orange, bazaar,* and *sugar* into French and English.

Since large animals took time to grow, many local farmers waited for the nearest annual fair and took their **horses,** cows, or sheep there. Vendors could be local or from far away, even from overseas. Fairs drew entertainers and gypsies as well as thieves. Fairs meant large meadows filled with animals brought from far away and the town square fenced off with animal pens. Fairs were not always held at towns. They were often held at crossroads where two main highways met. The fair's sponsor had to own the land and might put up temporary buildings.

A charter to hold a fair meant the sponsor had the right to collect fees from participants. Tollbooths outlined the fair grounds, and porters collected fees. The charter to hold a fair could be very lucrative, and it cost the king nothing to grant. It was a favored way of rewarding **knights** who had fought in the king's service, since it gave them income for life without the king having to pay it. Charters for fairs could be given to towns or to the owners of even small manors. **Churches** and **monasteries** also had charters for fairs.

Holding a fair also meant keeping order at the crowded event. The chief official with authority to make appointments and rules for the fair was called the Keeper of the Fair. In England, the charter included the right to hold a court of justice at the fair. The fair courts were first named *pied poudre* in medieval French, meaning "dusty feet." As English became the dominant language again, the name became *piepowder,* and the fair courts were called Piepowder Courts. A Piepowder Court dispensed instant justice for the few days the fair was in session. Any commercial disputes went immediately to the court. Unfair sales practices, pickpocketing, contract disputes, and disruptive behavior could all be tried almost instantly at the court. The court

could not jail or execute, but it had the power to put people in the public stocks and level fines. The charter gave the Piepowder Court full rights and a promise that other civil authorities would not interfere.

Each fair was traditionally held on the same day of the year, denoted by the **saint** honored on that day. Some towns held a fair to honor their patron saint. Some places had more than one fair in the year, and each fair benefited a different sponsor. Medieval Bath held four fairs; one benefited the king, one the bishop, one the convent, and the fourth benefited the town itself.

Each town had its own regional measurements. The keeper of the fair had a set of metal **weights** and rulers, and an official made sure the weights and rulers used by merchants matched the standard for that fair.

English Fairs

England's oldest fair, begun in Anglo-Saxon times, was Saint Giles Hill; its largest fair during medieval times may have been Stourbridge Fair. Some fairs grew so large that they dominated the nearby town and became a new town center. Saint Ives fair became the town of Saint Ives. Fairs proliferated during the 13th-century reign of Henry III, a king whose generosity gradually impoverished him. During the 13th and 14th centuries, about 5,000 fair charters were granted in England and Wales. Many began to specialize in one kind of trade. Tavistock held a large goose fair, and Horncastle had a horse fair. The priory of Horsham Saint Faith's held a sheep fair that later became the largest cattle fair in England. These specialty fairs mostly followed the patterns of the animals' seasons and the seasonal needs of customers. Goose fairs were most often held around Michaelmas, at the end of September, in preparation for the **holiday** feasts coming up.

Although fairs specialized, any kinds of goods could be bought at a regional fair. Chapmen and the representatives of international merchants sold raw materials: tin, **iron,** brass, **lead,** amber, wool, furs, wine, **spices,** and animals. The largest fairs attracted the finest international goods, while the smaller rural fairs had mostly domestic goods sold by traveling salesmen known as chapmen. They also sold manufactured goods: glassware, **pottery, tools,** knives, **cloth,** toys, and **jewelry.** The goods traveled on land by pack train—strings of mules and horses carrying things in sacks. Many medieval roads were not good enough to handle large **wagons.**

Early medieval fairs lasted three days: the saint's day and the days before and after it. Fair charters were extended over time, and some fairs began to go on as long as two weeks by the 13th century. Visitors to the fair, whether selling or buying, had to find a place to live. **Inns** were full, and some farmers rented places in their barns. The poor slept outdoors. Some vendors traveled with wagons they could sleep in. Large fairgrounds that had frequent fairs built permanent booths with small sleeping quarters for

rent. Peasants could advertise willingness to stable animals by posting a small bunch of hay over the barn door. They could advertise home-brewed ale with a branch posted above the house door.

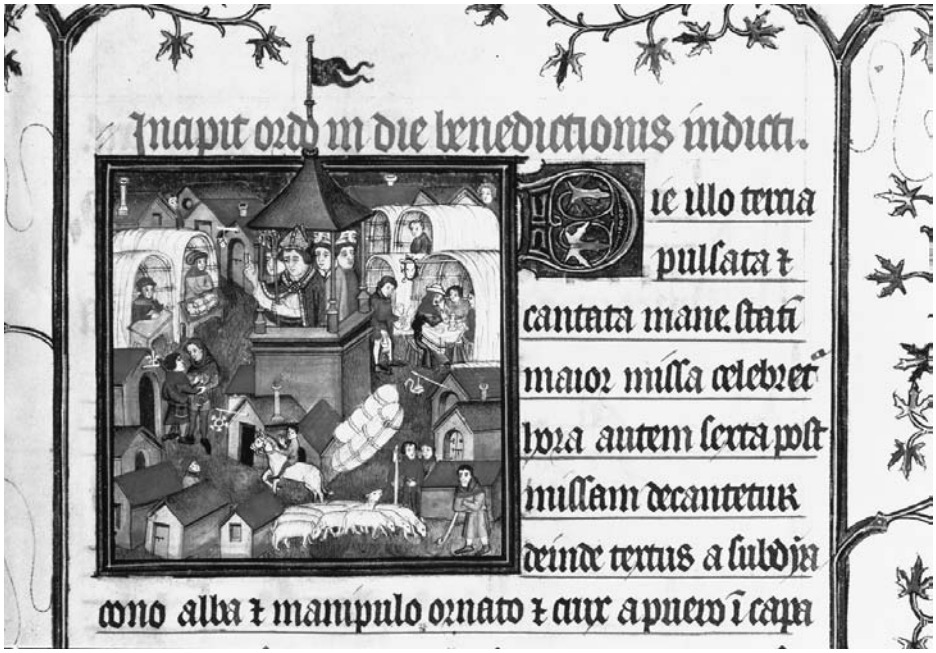
Fairs began with criers who announced the coming event. Vendors were gathering with their herds. The parish church began the fair with a Mass, and the mayor and town officials paraded to open the fair in their best robes. In earliest times, a glove was hoisted onto a pole as a banner—the symbol of the manor's power in force at the event. Later fairs used a ringing **bell** to open the fair. The town officials handed official jurisdiction of the fair to the Keeper of the Fair and his clerk, the official in charge of records, and made welcome speeches. They appointed bailiffs and porters to collect tolls for the fair; there were tariffs on all merchandise that passed the tollbooth. The clerk of the fair visited the vendors and examined their wares to be sure everything was in order. A large fair had notaries on hand to certify transaction receipts. Buyers had to present proofs of purchase to the porters as they left.

Entertainers traveled to fairs and put on shows after the sun had set and trade stopped for the day. Medieval traveling entertainers included **minstrels** and jongleurs of many kinds. Some sang, and some juggled or did other tricks. Some traveled with trained animals, such as monkeys or dogs. Many fairs also attracted athletic contests. In England, archery contests were popular. In the late Middle Ages, knights might hold a **tournament** for the spectators. There were animal sports, such as bearbaiting and cockfighting. Horse-trading fairs had races.

French Fairs

Fairs had a very ancient history in the land of the Franks. The fair at Troyes may have begun in pre-Christian times. The first fair at Saint Denis was held in 629 by grant of the Merovingian king Dagobert to collect taxes on the sales. The count of Paris was to collect these taxes for the king, and the grants were reaffirmed by kings into the time of Charlemagne and beyond. The Saint Denis Fair ran during the month of October. It was an international event from the start; merchants from Spain and Italy attended. During the 10th century, Flanders became a weaving center, and the counts of Flanders founded fairs to promote the cloth trade.

The most famous group of fairs took place in Champagne and was dominated by the Flemish cloth trade. The region of Champagne was midway between Flanders and Italy, and its towns were situated on a network of rivers that made travel easier. The counts of Champagne developed the region to make it more hospitable to trade. They drained swamps and built canals connecting the rivers. Champagne's fairs directly benefited the count, who hired inspectors, security guards, clerks, notaries, couriers, laborers, and



A medieval painter has crowded many details into a small space to give a sense of what the annual fair was like. A central building holds the officials, shown as taller than other men because they were more important. Around the margins, there are many small outbuildings; some are permanent structures and others are temporary. Countrymen bring in herds of animals while merchants show articles to customers outside their warehouses. Men meet to discuss news and purchases. An annual fair had a constant flow of people and animals for the weeks that it lasted. (Bibliotheque Nationale, Paris/The Bridgeman Art Library)

criers. The booths, stables, and **houses** on the fair grounds paid rent to the count, and the wool-weighing service paid fees to the Knights Templar.

Lagny had a winter fair in January, and Bar-sur-Aube held a fair during Lent. Provins and Troyes each had two fairs. Provins led off with a May Fair, and then Troyes held its Hot Fair at Midsummer Day. Provins held the Saint Ayoul Fair in September, and Troyes closed with the Cold Fair in November.

Each fair lasted 46 days. For the first week, cloth was exhibited, and then, for three days, buyers could purchase it. On the evening of the 10th day, the officials proclaimed the cloth fair closed, and during the next 11 days, leather was for display or sale. The last 10-day period was for avoirdupois goods, the many goods sold by weight. Avoirdupois goods included spices, wax, **sugar, salt,** dyes, grain, and wines. After the three sale periods were over, money changers were open for business, and then the fair closed. Merchants were given a period to restock and travel to the next fair.

The kinds of cloth sold at the Champagne fairs represented the widest variety of available textiles. A merchant could buy thick blankets from

Aurillac, velvet from Toledo, linen from Constance and from Champagne itself, fine woolens from Flanders in three grades of quality, silk from Italy, and brocade from Cyprus. Raw materials for the cloth trade were also important. Merchants sold raw cotton for stuffing quilted padding and dye ingredients in wholesale quantities. Buyers could choose from brazilwood and sandalwood, kermes and woad. Another wholesale product was alum, a component in the dyeing process. Alum was mined in North Africa and Asia Minor, so it arrived at the fairs from cities like Bougie and Aleppo.

The leather and fur portion of the fairs brought goods nearly as exotic. There were leathers dyed red and blue, specialized Cordova leather used for saddles, and sheepskins and furs from Norway and Russia. The leather and fur trade was particularly important at the Lagny and Provins fairs. Provins had a special hall set aside for furs and had tariffs for many different furs: ermine, otter, marten, sable, cat (including domestic cats), and polecat (a type of weasel, not a skunk).

The important cloth-producing towns of Flanders and northern France formed a trading league to regulate the cloth trade at fairs. They were required to bring a certain amount of cloth to the Champagne fairs so international merchants could always count on finding sufficient quantities for sale. They agreed to use the Champagne ell as the standard of cloth measurement. Manufacturing towns like Bruges and Lille built houses in the fair towns as warehouses and company headquarters. By the end of the 13th century, towns like Constance, Germany, and Lucca, Italy, also built or rented permanent houses in Troyes. But the fairs of Champagne began to fail after Countess Joan of Champagne married the French king Philip in 1284. The French king was interested in raising maximum taxes from the fairs and imposed such high fees and tariffs that the trade could not support them. Venetian merchants used their galleys to open a sea trade with Flanders, and the Champagne fairs had died off by 1320.

See also: Cities, Cloth, Holidays, Weights and Measures.

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Falconry. *See* Hunting

Farms. *See* Agriculture

Fasts

Fasts alternated with **feasts.** Feasts were images of heaven, but fasts were times of penance, when the body participated with the soul in remembering sin and death. Christians were supposed to pray for forgiveness of sin during these fast times. The key element of most fasts on the Christian **calendar** was to abstain from meat and dairy products. Alcoholic **beverages** were not forbidden, nor were **spices** and sweets. Only meat, eggs, and milk products were forbidden. The poor were most likely to have bean porridge on a fast day, although for many of them, every day was meatless. But for the wealthy, finding interesting substitutes for the forbidden **foods** was a serious endeavor.

The chief fast of the Christian calendar was Lent, the period of 40 days before Easter, but there were many other fast days. Every Friday was a fast day, in remembrance of Jesus's death on a Friday. Wednesday, when Judas accepted money to betray Jesus, and Saturday, in honor of the Virgin Mary, were the two other weekly fast days. Ordinary weekly fasts were not serious affairs; the cook just had to serve **fish.** Four times a year, once in each natural season, the normal fast days were observed with more seriousness; they were then called Ember Days. In the spring, the Ember Days were in Lent, and in the summer, they were just after Pentecost. They fell again in September's harvest season and last during Advent in December.

Lent was not the only long fasting season. Christmas Eve was a fast day, followed by the feast of Christmas. Advent, the four weeks before Christmas, was a fast period with the exception of a few saints' feast days, such as Saint Nicholas.

Lent lasted about six weeks. In preparation for Lent, which began on a Wednesday, people ate the remaining fresh meat on Tuesday. They also went to confession, which gave the day its name—Shrove Tuesday—but it became known rather as Fat Tuesday or Carnival, the meat day. Not only meat but also eggs had to be eaten up so they would not spoil and be wasted. Egg-rich pancakes became a common Shrove Tuesday tradition. During Lent, there was supposed to be only one meal, at evening, but through most of the Middle Ages, the one meal was at midday, with a second light snack at bedtime. Lent was a very long, hungry, dreary season for all but the wealthiest and best fed, and even they were tired of Lenten foods by the end. Although most medieval people took the Lenten fast with extreme seriousness, some **monasteries** began to find ways around the rules. Lent was kept in the official refectory, but not in the infirmary, where the

old and sick needed meat to remain strong. Many monks just went to the infirmary for supper.

The main substitute for meat on a fast day was fish. Medieval kitchens dealt with a wide range of fish, both freshwater and saltwater. Recipe books specifically mention herring, pike, bass, salmon, carp, cod, trout, perch, tench, bream, haddock, whiting, whale, dogfish, mackerel, flounder, sole, skate, cuttlefish, crayfish, porpoise, seal, lamprey, eel, oysters, lobster, crab, mussels, and more. Modern classification does not include seal, whale, or porpoise as fish, since they are mammals, and, of course, shellfish are their own class. But to a medieval cook, if it came from the water, it was a fish. Beaver and otter were classed as fish for a time, and the tail of the beaver continued to be permitted as fish. There were even fish that did not come from water, such as newborn rabbits. Finally, legend told that the barnacle goose, a migrating bird, was born from barnacles at sea and that it was a sort of fish appropriate for fast days.

Recipes normally made with meat were stuffed with fish or nuts during fast seasons. By the 12th and 13th centuries, cooks at large monasteries, manors, and **castles** could prepare fish, eels, and shellfish in so many ways that the table did not suffer at all in variety. Fish could not make up all deficits; recipes that called for milk or butter needed other substitutes. Almond milk worked in most recipes; the nut was ground fine and mixed with water, and its natural oils and nut meat formed a thickened white liquid that cooked up somewhat like milk.

Large parts of Northern Europe depended on butter as a main cooking fat. The alternative was meat fat, which was also forbidden, so it became difficult to cook. In regions that depended on walnut or olive oil, this was not a problem. During the later Middle Ages, the Pope began to permit regions to purchase permission to use butter on fast days. The money often went toward building projects, like **cathedrals.** Cheese was the other major milk product; during Lent, dairies continued to make and age cheese, but nobody was allowed to taste it.

A cook's most serious problem with creating palatable dishes with fish was the tasteless nature of most preserved fish. While aristocratic tables could serve fresh carp, eel stews, or salmon, most people made do with stockfish and pickled herring. Stockfish had to be pounded and soaked and could not be made into anything more interesting than fish stew or fish pie. Cod or herring preserved with **salt** made people very thirsty, and Lent was often a time of greater drunkenness as diners tried to wash down the salt with ale. Cooks rinsed and soaked salted fish repeatedly, and they used spiced sauces to cover the taste. Good cooks could do well even with salted, dried fish. A well-funded monastery could dine on roasted carp, herring soup in almond milk, spiced cod pies, and a variety of alcoholic drinks (from wine to cider to berry wines) to wash down the lingering salt.

See also: Feasts, Fish and Fishing, Food, Holidays.

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Feasts

In medieval Catholic tradition, feast days alternated with **fasts.** Advent, the weeks before Christmas, and Lent, the fast before Easter, led up to the most important religious feasts. For the common people, whose daily diet was always more like fasting than feasting, a true feast was a great occasion.

Public feasts were times for showing off wealth or power. Humbler people in the countryside put together feasts to celebrate **weddings,** and **guilds** put on feasts to honor their patron **saint. Knights,** counts, and bishops held **holiday** feasts at Christmas and Easter and on other feast days in the **calendar:** the Feast of the Ascension, of the Three Kings, and of other saints. They put on feasts to honor weddings, **tournaments,** and the dubbing of new knights or to honor the visit of a noble guest. Kings put on the grandest feasts of all, at times on a scale that staggers the modern imagination. One medieval English king's Christmas feast required 2,000 oxen and thousands of sheep, pigs, geese, fish, and eels.

For a great lord, such as a king or a duke, every dinner was a feast for the many members of his household. Still, some occasions were more than a large dinner. They were celebratory shows of wealth. They were occasions for the lord's cooks to show off their prowess and make their feast talked about for miles around. As literacy and access to **paper** became more common, some guests at noble feasts took notes on the **food** as it was served. A feast was the household's greatest display of ingenuity and excess.

Guests were seated according to social hierarchy. One of the house's senior **servants,** called a marshal or an usher, was responsible for knowing the exact rank and seating rules. A bishop was considered equal in rank with an earl and sometimes was referred to as a "prince of the **church.**" Archbishops were equal in rank but had to be seated separately, perhaps for the reason that one could not be elevated over the other. Secular lords also had an exact hierarchy of seniority. Everyone had an assigned place at a feast.

Real gold leaf made the crowns and cups shine in this book illustration showing King Arthur dining with other royalty. Although the artist's work is naive and simple where human body positions are concerned, he has carefully drawn the white tablecloth with graceful tucked draping. The table is properly set: each guest has a knife, a trencher, and a cup. Guests at lower tables often shared cups; even at this high table, some guests may be courteously offering to share. At each end of the table, there is a larger gold article that may be the salt container. There are serving dishes, but the 13th-century artist has not given us any actual food; the snowy white cloth and glowing gold dishes would leave a medieval viewer with no doubts of the unseen food's costly excellence. (Art Media/StockphotoPro)

Food at Feasts

At a feast, many dishes were prepared, but nobody expected to eat all of them. They were carried around by servants, and guests chose which dishes to sample. During the main meal, most dishes were meat or fish, with vegetables only as part of sauces or stuffing, if they were present at all. A feast might include stuffed eel; meat pastries; **fish** or meat in a yellow, green, or cameline sauce; and roasted meat. Each course that was carried around was the same mixed array of meat dishes, but the variety changed. There was no set plan of fish, meat, soup, or fruit. After the main courses, the table was cleared and desserts were offered in a similar way. Spice wine and whole **spices,** for digestion, could be part of dessert.

In **Muslim** Andalusia, an entertainer from Baghdad made a new feast style popular. Food was served in courses: soup, fish, meat, desserts, and finally a dish of nuts. He also introduced asparagus, which was popular in Baghdad. The idea of orderly courses very slowly made its way north and became the standard course plan in Europe during the Renaissance.

During the Middle Ages, Europeans outside of Spain did not accept the food course plan and continued to serve food in mixed courses.

The feasts of the wealthiest and noblest focused on presentation. Cooks used bright colors, such as saffron yellow, to dye food unnatural colors. A proper feast had yellow and green sauces, bright red meat compositions, and blue puddings. The first artificial dyes, borrowed from the science of **painting,** came into use. A lichen, *Gozophora tinctoria,* turned red in the presence of acid and created a brighter red than natural coloring from rose petals or grape juice. Since many recipes called for meat, fish, or grain to be ground and boiled, a cook could disguise a food's nature with color very easily. Fish is pale in color, so a cook could use a ground fish paste to make bright red or blue jelly. He could arrange squares of colored fish or meat jelly like a chessboard. Colored glazes could dress up a roast, pudding, or pie in its last minutes of baking.

Many favorite dishes were meat pies, and pastry presented many opportunities for decoration. The simplest decoration was made from pine nuts or pieces of pastry cut into leaves and flowers. Cut pastry and colored glaze allowed a cook to add a coat of arms to the top of a pie to honor a noble guest.

Dishes were often made to look like something else: a fish concoction made to look like a turkey, a rice and almond mix molded to look like a fish, or a chicken dish made into a flower. The modern image of a medieval feast with a boar with an apple in its mouth would be the simplest of such visually stunning dishes. **Castles,** swans, and dragons made of food could be present at a king's feast. The nursery rhyme that speaks of "four and twenty blackbirds baked in a pie" preserves a real trick royal chefs used. The pie pastry, baked in advance with a hole in the bottom, was filled with small live birds. The birds were not themselves baked, but, to the guests, it appeared that they had been. As the pie was cut open, the birds flew out into the rafters, and a real pie, perhaps embedded in the larger false crust, was presented instead. Another favorite presentation piece was the giant egg. A small animal's bladder was filled with beaten yolks, and it was placed inside a larger bladder filled with beaten whites. Tied shut and suspended by a string, it was boiled to create a huge hard-boiled egg that could be announced as the egg of a mythical creature.

The showy plumage of swans, peacocks, and pheasants presented the cook with a theatrical opportunity. The bird was flayed with skin and feathers intact, and the flesh and bones were drawn out. The meat was cooked, often stuffed with other small birds, and replaced in the skin and feathers. The feet were sometimes gilded with powdered **gold** or saffron. Wires and skewers propped it into the shape of a live bird as it made its grand entrance with sparks flying out from lighted camphor in its beak. The host or guest of honor was often expected to make a vow at this point. Since these game

birds might not taste as good as their feathers looked, some clever cooks substituted roast goose for the peacock or swan.

By the 15th century, the most aristocratic feasts had become theatrical events. A theme could be the Castle of Love, and the food would be staged, displayed, or presented with scenery. The wine would flow in a fountain of love, and the food could be staged in a wooden castle carried in on a platform by four men. The food could include dishes shaped into castles made from ground meat or pastry. A tableau of Venus and her court could be staged between courses.

Dessert after a feast was always highly spiced. Medieval doctors believed that the stomach cooked the food and that it must be kept warm in order to do its work. Spices were hot and dry and would feed the stomach's fires as it processed the meal. Dessert wine was sweetened and spiced. It was called hippocras and could be spiced with cinnamon, ginger, mace, or other popular spices. The servants also carried around a tray of spiced fruits or candied whole spices.

Manners at Table

The key points of medieval feast manners were to honor those who were highest in the social hierarchy and to keep from annoying dining neighbors in a setting of very communal eating.

The great hall was set for a feast by arranging a high table that lay perpendicular to the other tables, at the narrow end of the hall, and usually on a raised platform. This table—called a dormant table—was often the only permanent table in the room, and it usually had a **tapestry** hanging behind it. It was covered with a large white tablecloth. The lord's chair sat in the middle of this table, facing the hall. Guests were chosen for the high table in accordance with their rank or with the honor accorded to them for the occasion. The winner of a tournament would be honored at the feast even if his social rank was usually inferior to the high table. Otherwise, the table held only invited aristocracy. The best food came to the high table, and it was served first. At the high table, the lord's place was set with a knife, and other places could also have knives. In the 14th and 15th centuries, the high places could have plates, and each place had its own cup. Food was served individually at the high table, which had its own carver. The high table had a special salt container called a nef; it really held salt but was also a decorative centerpiece. The nef was made of silver or gold, and it was often shaped like a **ship** (one kind of ship was called a nef) or a castle. The most elaborate were large enough to have spare knives or small containers for other condiments.

The temporary tables, made from boards on trestles, also had white tablecloths. These could be used to wipe hands or even the mouth, unless a

separate linen napkin was provided for this purpose. Each place setting was a thick slice of bread as a plate. From the 14th century on, spoons made of wood or horn were set at places as well. Guests brought their own knives. In late medieval Italy, the aristocracy began to use small forks, but they were not used anywhere else. One cup served for two place settings. **Salt** cellars at the table completed the setup. Diners dipped the tip of a clean knife into the salt bowl, and then put the salt onto the food on their individual trencher.

The lower tables were most often arranged as a three-sided rectangle, with diners seated only around the outside. Waiters could move in the middle, and all diners faced the high table. The table immediately to the right of the high table was called the rewarde, and it was a place of honor. Both tables closest to the high table were places of honor, and guests were seated farther from the high table as their status dropped. The farther tables received less attention from waiters and had to wait for food and drink. Medieval people expected not to receive the same attention. Everyone knew their rank, who was above and below them, and what they could expect.

Cups were made of a variety of materials during the period. The earliest medieval drinking vessels of Northern Europe were horns with feet to make them stand up. Early cups also included wooden bowls. Most later medieval cups were **pottery** or **silver. Glass** was rarely, if ever, used for drinking cups during this period. Great houses had fancy cups and spoons, fancy pitchers and basins, and finely decorated tablecloths. In a period when there was a great emphasis on conspicuous consumption and appearance, dishes could have all kinds of decorations.

In the late Middle Ages, a wooden (or even silver) plate, called a trencher like the bread it replaced, came into use among the rich. Before that, the thick slice of bread was the only plate. Bread for a trencher had to be thick, coarse, and dry. Its sole purpose was to soak up drippings and hold the food, not taste good. At the end of a meal, the trencher—soaked in sauces and drips and sliced up by the knife—could be eaten, but it usually wasn't. Bread for eating was provided at the table, separately, perhaps wrapped in napkins. At the tables of the wealthy, trenchers were collected and given to the poor, or sometimes they went to the **hunting** dogs' kennels.

Male guests did not bring their wives to great feasts. The ladies present were only of the host family and its attendants. In the late Middle Ages, the restructuring of the hall to have a side-wall fireplace, rather than a central fire pit, meant the rooms immediately above and around the fireplace also were warmed. The chief room just above the hall, accessed by a staircase, was the lord's private chamber. Ladies began to choose to eat separately from the hall, in a quieter place, and eventually the upper chamber became the place where the lord, lady, and select guests could eat more expensive food than was available in the hall.

To begin the feast, the lord, his family, and his guests at the high table were seated first, and grace was said while others stood at their places. Guests at the lower tables could then sit down. Servants tested food for **poison** and carried around **water** basins and towels for hand washing. Carvers began serving food at the high table, and then servers brought platters to the lower tables. A butler made sure that pitchers of wine or ale were circulating to keep cups refilled. At the finest feasts, a wine fountain in the center of the room refilled the servers' pitchers.

Food came to the tables on platters sized for between two and six people. Chargers were platters with food for two and were placed between pairs of diners. The younger cut and served for the elder, or the man for the **woman,** or the social inferior for the superior. Sauces came to the table in bowls, and, since meat was already cut into pieces, the diner could put meat pieces onto his trencher and then dip them into the sauce before eating. Soups were thick and had pieces of bread in them that could be picked out with the fingers.

Most eating was done with the fingers, so they had to be kept clean. At many feasts, servants periodically circulated with ewers and basins. They offered to pour water over each guest's hands, catching the water in the basin, and then offered a towel. Some halls offered finger bowls of water scented with roses. It was not acceptable to lick one's fingers before putting them into the common serving bowl to take out pieces of food. It was not acceptable to leave one's spoon in the serving bowl or to take food with a visibly dirty spoon. It was not polite to scratch one's head or any part of one's body while eating or to pick one's teeth with the knife.

Bones and rinds went into an empty bowl called a voider or were tossed to the floor. Rushes and flowers were sprinkled on the floor to hide the bones, but the lord's hunting dogs often wandered the hall, picking up scraps. Although the floor was not swept more than a few times a year, a major feast called for a clean floor strewn with fresh herbs and rushes. The servants cleared the tables between courses, and, by the dessert period, the dishes and scraps were gone.

Many feasts concluded with **drama** or **music** and **dancing** in the center of the hall. The castle's kitchen and scullery would be jammed with dirty cups, spoons, and platters, but the hall was free of its mess and noise.

See also: Beverages, Food, Furniture, Holidays, Kitchen Utensils, Poison, Weddings.

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Fish and Fishing

Fish, a staple food since ancient times, took on new importance in medieval Europe. The Catholic Church declared **fast** days when fish could be eaten, but not meat. In the upper classes, where meat was the core of their daily diet, a large quantity of fish had to take its place on those days. Both ocean and freshwater fish flooded into **castle** and **monastery** kitchens. Fish were farmed, as well as caught wild with nets, traps, spears, and rods. The fish preservation industry, centered on cod and herring, became one of the biggest international businesses.

Medieval fisherman caught the same kinds of fish we catch today, with only a few differences. Medieval lists of fish have many familiar names: trout, pike, bream, perch, plaice, sole, sturgeon, and salmon. The best-selling fish in London was the herring, but second came flat fishes like plaice and flounder. They also classed shellfish as fish in terms of permissible fast-day diets. Lobster, crab, mussels, oysters, and scallops were all popular with those who lived near the sea. Shellfish were not easily preserved, for the most part, so only seacoast nations like Portugal could indulge in them. One medieval freshwater fish that is no longer much regarded is the eel. Eel were plentiful and easily caught, and they were considered very good food, both fresh and smoked. Some water mills had to pay rent to the landowner in eels.

At sea, medieval fishermen chased whales in small **boats.** Whales came into the Bay of Gascony, in southern France, and lookouts could see the spouts and alert boats to give chase with harpoons. Unlike the later Victorian-era whalers who wanted only the oil, medieval fishers sold pieces of whale at the fish market. They did not have a sense that whales were mammals and simply considered them very large fish.

Two kinds of fish required transport from a distance, which meant learning to preserve them for commercial shipping. The most important preserved fish were cod and herring. Herring was the most popular preserved fish of the Middle Ages. Herring live on the seabed, but, in the month of

March, they rise to the surface and swim in great shoals to their spawning grounds near the coast. The season was short, but it was just in time to supply the meatless season of Lent. Although small, herring could be netted in large numbers using drift nets.

Basque fishermen discovered the cod banks off Newfoundland around 1000. They were in the area pursuing whales and followed the cod to the Saint Lawrence River mouth. They kept their cod banks a secret from the rest of Europe until other sailors discovered them in the 16th century. Cod were also plentiful around Norway, Greenland, and Iceland. They were fished with lines and greedily swallowed baited hooks. The best technique that developed was to use a strong, long line that had many short lines with hooks attached to it. A boat pulled the line through the ocean behind it and then hauled in the cod.

Catching and Farming Fish

Although cod were caught with lines, nets were by far the most common fishing method. The seine net was shaped like a bag, with weights along the bottom and floats along the top. Two boats cast it into the water, carried its ends apart to open it, and then moved together to close it. If they were working across a river, the current carried fish into the net. The seine net adapted for the ocean was a drift net or a trawl. A drift net had more floats, while a trawl had more weights. The drift net stayed near the surface and picked up large schools of fish such as herring. The trawl moved to the bottom of the water and was pulled by two boats before being raised.

Traps could be used on both river and sea. A fish trap in a stream or river was made of wood and wicker, with a removable net at the point. The fish, finding its way up- or downstream blocked, moved toward the center opening and found itself in the net. A stream trap could also be smaller: a wicker basket fixed in the current to catch fish that came along. Some rivers had so many fish traps that it grew difficult for boats to pass. **Monasteries** frequently had large fish traps in nearby streams.

A sea-based fish trap used the beach and the tide. Posts and wicker built along the beach in a *V* shape allowed the tide to pass over and through, but, as the tide went out, fish left behind were trapped behind the wicker fence. Seeking to remain in the water, the fish swam along the fence until they found themselves in the long net positioned at the point of the *V*.

Spears were long wooden poles with barbed prongs and were mostly used in inland streams. For eels, the prongs had finer teeth, like a comb, pointing up out of the water so the eel would be caught in the teeth and unable to escape but not necessarily killed or damaged. Most eels were caught in traps; spearing was a difficult way to fish.

This wall painting from the early 14th century shows some fisherman working to pull in a net. Net fishing was the most common kind, practiced in deep rivers, ocean bays, and coastlines. The men shown here could be in any of those settings, since the water is depicted with choppy waves. (The red background with a repeating pattern was a common wall painting style called diaper.) (The British Library/ StockphotoPro)

Fishing with a rod and line was called angling, and, by the 15th century, it was a leisure sport for gentlemen, as well as a practical means of getting food. The best rods were made from two pieces of wood, one fitted into the other, so the end was thin and flexible while the handle was stronger. Fishing line was made of hair from a **horse**'s tail, and the line was stronger depending on how many hairs had been twisted together. Lines were often attached to a wooden reel so they could be wound in after being cast out into the water. They had a hook, similar to a modern hook, and a weight. As the art of fishing developed, lines of differing weight were available for smaller or larger fish. Fishing poles, too, were developed, and, by the close of the Middle Ages, they could be made from several different kinds of wood for strength and flexibility.

Those who could afford to have a private fishpond or lake could keep their fish easily caught and alive as long as possible. Manor houses and monasteries often had artificial ponds within their grounds. Some were very large, as big as 50 yards by 20 yards. In spring, pond owners caught wild fish and moved them live into the pond, where they bred and lived until needed. The fresh fish eaten at **feasts** was usually farm raised, rather than caught wild.

In later medieval years, two developments made possible the farming of fish on a scale larger than the monastery or estate fishpond. First, water mills had been improved with a vertical wheel, and their technology had

become very common. Many mill engineers knew how to build and maintain a good millpond with a dam and controlled floodgates. Second, around the middle of the 12th century, a fish native to the Danube River migrated into central and northern Europe as the rivers warmed at the end of the Medieval Warm Period. The carp is related to both the minnow and the goldfish, but the common European carp can grow up to five feet. It tolerates a variety of conditions, including low oxygen in the water, and it will eat nearly anything. It can survive in a frozen pond, and it spawns several times a year. It was an ideal fish for farming.

Fish farms turned into multi-pond operations. Carp spawn in warm, muddy ponds with plenty of water plants, so the farms kept such ponds and placed adult fish into them to breed. When the eggs had hatched into fry, the adults were removed and returned to a fattening pond. The fry remained in a warm, muddy growth pond for a few years, and then spent a few more years in a pond with other growing fish. It took five or six years to raise a carp to the right size for eating. When it was time to harvest the fish, the pond could be drained so they were easy to remove. Some pond systems were constructed by damming a stream; others were raised and built into descending steps. A large carp farm in the middle of the 14th century could have several dozen ponds that separated the carp by age. The fish farmer always knew which ponds to harvest each year.

Carp was a very profitable product. Monasteries bought carp in great numbers, as did nobles. So many carp farms were built through France, Germany, Poland, and Bohemia that some areas began to suffer mosquito-borne illnesses from all the new, boggy, wet ponds that were not natural to their environments. Carp farming boomed for about a century and then began to decline.

Preserving Fish

Fishermen who wanted to sell their catch close to home sometimes kept the fish alive as long as possible by carrying them in boats with netted wells in the water or **wagons** with water tanks. But for the fish that had died in the process of being caught, or for fish caught farther away, preservation was necessary.

The simplest way to preserve fish was to dry it in the wind. The cold, windy coasts of Norway and Iceland were perfect for quickly drying cod. The cod were gutted and laid on wooden racks or laid out flat on stones. In a few days, they were completely hard and dry, and they kept for a long time without spoiling, perhaps years. Dried cod was called stockfish, and it was the only export of Iceland. Although it was healthful and cheap, stockfish was not easy to cook. *Stock* meant a block of wood, which is what a stockfish was like. In order to make it tender enough to eat, the cook had

to pound it with a hammer, soak it for at least a day in water, and then cook it for a long time.

Fish could easily be smoked. Before the invention of the chimney, **houses** normally had thick smoke above head level, slowly finding its way to the smoke hole. Hanging gutted fish on the rafters lightly preserved it by drying and partially cooking it. Fish could also be soaked in saltwater first so it was salted and smoked. Smoked fish did not keep as long as dried fish, unless the fish became as thoroughly dry as stockfish. Later, when fish was processed commercially, special smokehouses created higher temperatures and thicker smoke; the flavor of the smoke was controlled by the type of wood used in the fire.

Salting was the primary way of preserving fish, and its methods became more refined throughout the Middle Ages. Obtaining enough **salt** was the first problem, and getting adequate coverage of the fish to kill bacteria was the second. Salt could be evaporated or boiled from seawater or salt springs or mined in salt caves. Most salt was evaporated from seawater, and the best salt came from the Bay of Biscay. Its common name, bay salt, came to mean any sea salt. Fishermen had to buy this salt as cheaply and plentifully as possible.

Dry salting meant gutting and flaying the fish so it was as flat as possible. Layers of fish were spread thickly with salt, and more layers of fish and salt were pressed on top. It was difficult to ensure the salt reached every bit of the fish. The salt drew liquids out of the fish, and the layers had to be turned to create an even cure. It took about 15 days to create properly cured salted fish. Dry salting worked best with cod; they were sometimes salted at sea to preserve them as freshly as possible. Dry salting was not as effective with herring because their oily content prevented the salt from soaking in properly. Dry-salted herring could still turn rancid.

Fish could also be preserved using a saltwater solution, or brine. Soaking the fish in heavily salted water ensured the salt soaked into all parts of the fish, and it was more effective with herring. The last step in preserving herring was the development of salting and brining at once, in **barrels,** which pickled the herring and kept them best of all. Barrel making was an established art by the Middle Ages. Coopers could make strong, tight barrels with a lid that could be fastened down and a hole drilled in one end—the bunghole. Barrels were ideal for herring, which were so small that hundreds could fit into a single barrel.

Pickling herring was mass-produced around the Baltic Sea and the North Sea. When a herring catch arrived, teams of **women** gutted the herring rapidly and rolled them in salt. They laid the herring in layers on the bottom of a barrel, with each closely packed layer at a right angle to the next. More salt was sprinkled on each layer. When the barrel was full, they sealed it and set it aside for 10 days. Opening the bunghole, they drained off the liquids

from the salting, shrinking fish. They opened the barrel's lid and combined the contents of another barrel to keep the contents packed full. Some brine was added, the barrel was sealed, and it was ready for sale.

By the late 11th century, herring was shipped in huge quantities all over Europe, first to areas within a day's journey of the seaports. Great Yarmouth, in England, had a special Fish **Fair** every fall. It lasted seven weeks and drew international traffic. As time went by, herring was available farther inland. It was the most sought-after fish because it was easily carried in large barrels. It became the normal rations for an army, the Lenten food for nearly everyone, and the daily fare at many monasteries. Herring was even used as currency in some places and times. Since all of it came from far-off places, its processing, shipping, and marketing came on an increasingly large commercial scale.

Brine picking of herring was first done in southern Sweden, where rock salt from German mines combined with plentiful herring in the Baltic Sea to create a booming fish market. They packed the herring in salted layers in a cask, allowed the fish to dry in the salt, and then repacked it with fresh brine. The North Sea was another good source of herring, and English and Dutch ports also developed the industry. Scarborough and Yarmouth, in England, had fish processors working with fishing boats coming in from the North Sea.

The need to import large quantities of salt, to make sure barrels of herring coming out of a port would uphold the port's reputation for good herring, and to control shipping all contributed to the development of an international, regulated, organized commercial fishing market unlike what Europe had seen before. During the 12th century, the cities of Hamburg, Cologne, Danzig, and Rostok contracted with Lübeck to control salt mining and herring packing in the Baltic Sea. The alliance became known as the Hanseatic League, or, in its own time, simply the Hanse, which meant "alliance."

The Hanseatic League standardized their products. Pickled herring had to use good salt from Portugal, and every barrel had to be properly cured all the way to the bottom. They created a monopoly on pickled herring and extended it to other commodities such as timber, grain, and Norwegian stockfish. They combated piracy and enforced common regulations on any businesses that wanted to work with them.

The league also developed the cog, a simple, boxy **ship** that maximized its cargo potential. Its deck was designed so seawater that splashed on deck would drain into the hold, where it would add weight and stability. Since the cargo was entirely barreled, it could get wet without damage. Cogs could carry 5 or 10 times what other ships of the time could carry, and they made possible the huge volumes of herring and stockfish that supported Europe's monasteries, armies, and poor.

The Hanse operated aggressively and created monopolies where possible. For example, they began trading in Bergen, Norway, where grain was scarce and local merchants would not turn away ships filled with grain. Because the Hanse cogs could carry more cargo, they quickly dominated the Bergen market in exporting stockfish. Fish processors sold directly to the Hanse merchants, instead of trying to compete. Iceland's stockfish all came to Bergen, and the Hanse, which controlled this port, forbade trade in other Norwegian ports or with Iceland directly.

In the 15th century, Dutch herring fishermen on the North Sea developed a larger drift net, and, around the same time, they began processing herring right on the water, in a large cargo ship called a buss. Because the busses could follow the fishing fleet, the Dutch could go farther in search of herring shoals, and they began to compete with established herring ports such as Skänia. They also began to use a new gutting method that made the pickled herring keep even longer. But after 1400, herring catches diminished due to overfishing and **climate** change. Arctic pack ice increased, and ocean temperatures dropped. The international fishing industry's boom years were over.

See also: Climate, Fasts, Food, Salt, Ships and Boats.

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Flowers. *See* Gardens

Food

The food culture of the Middle Ages varied widely by region, century, and social class. A few general statements are true for most places throughout

the period. People ate a limited, unvarying diet. They had two meals a day, at noon and around sunset. Breakfast was unknown, except for invalids and **babies.** Food was scarce; most people did not get enough to eat. The poorest were hungry all the time, and there were sometimes regional famines. In some unfortunate years, all of Europe was plunged into famine. Toward the end of the Middle Ages, food became more plentiful. The meat-based food we know as a typical European diet did not become typical until after 1400.

Emperor Charlemagne helped establish some food customs by regulating **agriculture** on his many farms. As the king ordered, so many lords and barons imitated. Charlemagne required that chickpeas and broad beans must be grown, in addition to grains. These legumes became widespread in the diets of French and German peasants. He required that every manor must keep at least 100 hens and 30 geese because this number of poultry could maintain the flock's size and still have eggs left over for eating. He mandated **beekeeping** on every manor and required two-thirds of the honey to go directly to his table. These measures must have stabilized and enriched agriculture even outside his farms. On the other hand, he set high fines for any peasant who snared a hare on his property, and he outlawed the killing of wild ducks, pheasants, doves, and other birds. With this precedent, Europe's poor lived on a mostly meatless diet for many centuries.

Raw Materials: Grains and Vegetables

Medieval Europe's grain fields were not sown with pure seed. Many fields grew wheat and rye together, and they were harvested and milled together; the mixed flour was called maslin. Maslin with more wheat made finer bread and went to the tables of the wealthy. Barley, a staple grain from Roman times, and rye, which grows in harsh conditions, were the most likely grains for the poor. Some regions also grew millet, which keeps longer than wheat and could be stored in case of famine or **siege.** The worst soil could grow buckwheat, an edible grass imported from China. During the 12th century, medieval farms began to grow oats, too, but they fed **horses,** rather than people. Rice was the latest and rarest entry; it could not be grown north of Italy. It was imported from **Muslim** Spain and North Africa and was only a luxury food for the rich, usually ground into flour and used as dainty food for the sick.

Grain had to be ground at an official **mill,** and the miller was the local lord's employee. Farmers who brought their grain to the mill could expect the miller to keep a portion as tax and payment. One way the poor got around the fees of official millers was to eat porridge, which could be ground roughly at home from anything on hand: barley, millet, chestnuts, buckwheat, or dried peas.

The people in this picture are crushing grains, kneading dough in a trough, and placing round loaves in an oven. The oven's heat had to be stoked as hot as possible in advance, so the baker must use a long stick to slide the dough into the hearth. They are working in outbuildings; the manor house can be seen in the background. The bakery buildings are falling into disrepair, but the highest priority was distance from the main house, not the baker's comfort. Near the bakery, there is a walled garden and some fruit trees. Every estate had to provide as much of its own food as possible. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

Vegetables formed a central part of Mediterranean Europe's diet, but it is difficult to know how much they were eaten in Northern Europe. They are rarely mentioned in medieval recipe books and are used only as flavoring to meat. Physicians were suspicious of their wholesomeness and insisted they must all be cooked, if eaten at all. However, vegetables may have been a daily part of the diet, even so. Recipes were written by cooks for other cooks, and something as simple as stewing cabbage did not need any instructions.

The chief vegetable type of medieval Europe was the root crop: onions, radishes, leeks, turnips, beets, carrots, and parsnips. Carrots were not orange; they were purple-red or greenish-yellow. Both red and yellow beets were a very common food, both root and leaf.

Cabbage was native to Europe. It did not grow in tight round heads, like modern cabbage; it was loose-leaf, like kale. All over Europe, peasants ate cabbage as an everyday food and often made it into sauerkraut. In Italy, types of cabbage were cultivated into what we know as broccoli and cauliflower. Lettuce, too, was grown, but it was not eaten raw as it is today. Physicians considered raw vegetables unhealthy, and lettuce was too cold and wet to be recommended. Lettuce was cooked like spinach, another leaf crop of medieval Europe. It was only eaten as salad in the later Middle Ages, and only in Italy.

A few kinds of legumes entered Europe through the Mediterranean region. Broad green beans, also called fava beans, were a common crop; chickpeas, too, were present in many gardens, including Charlemagne's. Peas, always dried for later boiling, were the other common kind of legume. All these beans were the diet of poor peasants and monks. Although modern dieticians would consider beans the ideal food for the Middle Ages—easy to grow, easy to preserve, and nutritious—**castle** folk rejected the universal pease porridge of their servants and farmers.

They also grew cucumbers, melons, asparagus, and eggplant, the last two only in the Mediterranean countries. Many of today's common vegetables were not yet cultivated or had not yet been imported from the Americas: iceberg lettuce, string beans, orange carrots, tomatoes, potatoes, and peppers. None of these were known in medieval Europe.

Medieval fruits are familiar to us: apples, pears, peaches, plums, apricots, cherries, strawberries, and grapes. The actual fruits, of course, were smaller and not as sweet as today's. Although the poor must have eaten wild and windfall fruits in any way they could, including raw, official Europe ate its fruit cooked. Apples were always cooked and might be found in soups and meat dishes, as well as in tarts. The most common type of pear was the Caillou pear; it was hard and needed to be baked. Plums were dried into prunes and then cooked; peaches and apricots were stewed. Grapes, strawberries, and cherries had not yet been cultivated into our large, sweet eating varieties. Finally, a major use of these fruits was in seasoning. Vinegar was spoiled wine or cider, and it was a universally prized flavor, as was concentrated sweet apple or grape juice.

Oranges had been imported to the Mediterranean from Palestine, and the Romans grew them in North Africa and Sicily. They remained a Mediterranean fruit, not much known outside their growing region during the Middle Ages. Figs, too, remained a Mediterranean specialty. Preserved, sugared figs were among the luxury desserts of medieval nobility. Pomegranates, citrons, and lemons grew in the Mediterranean, while the Arab culture of Spain cultivated dates. Some of these exotic fruits were exported to Northern Europe as a luxury food.

Nut trees grew all over Europe. Walnuts provided cooking oil for many parts of France, while hazelnuts, filberts, and, above all, chestnuts were roasted and boiled or even ground into flour in times of famine. The Mediterranean region provided almonds, pistachios, and pine nuts. Almonds were used extensively in aristocratic recipes. They were not eaten raw or roasted, as we eat them; they were pressed for almond milk or almond oil or ground into marzipan, one of the first candies.

Last but not least, medieval Mediterranean Europe grew olives. Italy and Spain were the chief olive-growing regions. Where olives were plentiful, they were preserved in salt brine or pressed for cooking oil. Olive oil exported to Northern Europe was very expensive and could only be used for religious rituals or medicine.

Raw Materials: Animals

The most important medieval **animal** was the pig. Short-legged pigs were kept in sties, while long-legged pigs ranged like sheep and were tended by swineherds. Pigs are omnivorous and could forage among forest acorns or street garbage. They were easy to tend, although probably disease carriers and shunned by **Jews** and Muslims. Medieval people made ham, bacon, sausage, and lard. They ate the feet, ears, head, tail stomach, tongue, and liver. The intestines and bladder became sausage casings. Pork fat was the single most common cooking fat; it was more plentiful than nut oils and butter.

The next most important farm animal was the sheep. Sheep provided both cheese and meat. They were not as easy to keep as pigs because they had to move between summer and winter pastures, but they made good investments for **monasteries,** estates, or butchers. Sheep were not cheap, as meat, because of their other uses. One ewe could produce enough milk for about a half pound of cheese per week, not to mention the wool. So while spring lambs and worn-out older sheep were sometimes eaten, mutton in general was too expensive for the common man.

Cattle, domesticated from the wild ox, had been raised all over Europe from early times, but peasants raised far fewer cows than pigs. Cattle provided dairy products, and then all parts of the animal could be eaten: meat, fat, tongue, brain, heart, liver, and even the udder. Beef was not popular with the aristocracy because it was considered coarse and common.

Most milk, from both sheep and cows, was quickly turned into cheese and butter to keep it from spoiling. Cheese making became a skilled art during the Middle Ages, mostly developed in French monasteries. The first Roquefort cheese was made of sheep's milk and served to the Emperor Charlemagne at an abbey. It was veined with mold, but he liked it, and he required the abbey to send two crates of it to his palace every year. He also requisitioned two crates of a similar cheese from an abbey at Brie.

Large cheeses, often made in large round wheels and sold in cut sections, developed during the 12th century in France and Italy. They were community projects because they required about 25 gallons of milk at a time. These 12th-century large cheeses included Parmesan, Gruyere, Beaufort, and Emmenthal.

Butter was not known in the Mediterranean regions of medieval Europe, but it was widely eaten in the regions settled by the Norse: Scandinavia, England, and northern Germany and France. Butter was the main cooking fat for these regions, which became a problem during Lent and on other **fast** days, when animal products could not be eaten. In the later Middle Ages, some Popes gave personal dispensations to permit eating butter on fast days; sometimes these dispensations were sold. In 1495, the Pope granted a dispensation for butter to all of Germany, Hungary, Bohemia, and France.

Pigs, sheep, and cattle were large animals that required large-scale slaughter, so butchers handled all the meat for towns and **cities.** They often had to raise their own animals in places where country folk were reluctant to sell to towns. They grew very rich, forming corporations and controlling all slaughter and meat sale. Butchers' shops were a cause of pollution and infection, since they created large amounts of offal and attracted flies, rats, and pigs. Most medieval town plans restricted butchers to outside the town walls, but slaughterhouses came within the walls as towns grew. Meat sales were restricted to daylight hours to prevent fraud.

Not only the best cuts of meat, but nearly everything else, could be sold and eaten. Animal organs such as the liver, kidneys, heart, and lungs were delicacies used as stuffing and in pies. Stomachs were used to roast or boil mixtures of meat, eggs, nuts, and spices. Other entrails were termed *garbage* in medieval English and were prized as ingredients for meat pies.

The medieval hog pictured here has long ears, a long snout, and the razorback line of stiff hair that we associate with wild boars. The butcher's work was messy; the man in the picture may be wearing leather chaps over his legs to protect his clothing or skin. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

Blood made sauces, bone marrow made puddings, and feet were boiled for jellies. Animal fat was used for cooking and other purposes such as grease and lamp fuel.

Farms and towns also raised poultry. The most popular bird was the goose, eaten roasted. Even in medieval times, geese were force-fed to make their livers grow too large. These fatty livers are the basis of *pâté de foie gras* ("pudding of fat liver"). Medieval farms and towns also raised chickens and ducks, as well as small birds we hardly think about in modern times: peacocks, pigeons, and doves. Turkey was an unheard-of luxury in the late Middle Ages; the first roast turkey was served to Philippe of Burgundy in 1385. The king of birds, for aristocratic palates, was the peacock. Its appearance was exotic, although its meat did not really taste good. Hunters brought home wild birds: pheasant, partridge, quail, heron, crane, and swan.

Chickens, geese, and ducks produced eggs, which were even more important than meat. Eggs were an important part of the diet, except on fast days. Eggs were forbidden during Lent, the 40 days before Easter. For these 40 days, eggs had to be collected but not consumed. They could be hatched, or they could be boiled for better keeping and then eaten at Easter when Lent ended. The custom of decorating eggs for Easter comes from the Lenten fast.

Three wild animals were commonly eaten during the period: boar, deer, and hare. Boars were hard to **hunt** and much prized as food for the aristocracy; a boar's head was roasted at Christmas. Deer came in three kinds in Europe: roe, fallow, and red. The stag, also called a hart, was most prized, and only skilled hunters could bring them down. Deer could be kept wild on enclosed tracts of forest so they could be more easily hunted for feasts. Venison was usually roasted or chopped to make venison pastries. The hare is native to Europe; it is larger than a rabbit, and its flesh is darker and tougher. Rabbits are native to Morocco and were brought into Europe during the Middle Ages, so they were much less common. Both rabbits and hares were roasted, stewed, or put into pies.

Last and far from least, there were **fish.** No animal products could be eaten on fast days, including the 40 days of Lent, but fish were not considered animals and could be freely eaten. Estates and monasteries included fishponds, so most freshwater fish was farm raised. Sea fishing provided cod and herring; these were only seen in salted form in most of Europe. Eels were typically smoked for a few hours above the cooking fire and then later boiled to soften them. Smoked eel was a common food year-round, but especially on fast days and during Lent. Eel was a common daily food for monks; available in streams all over Europe and easily caught, eels and lampreys were perhaps the best-known fish of the poor man.

Preservation

Meat and fish were preserved with **salt,** by drying, and by smoking. Salt preservation was either dry (done by packing salt closely on all surfaces of the meat) or in brine (a water and salt mixture). Some salt and brine operations became large industries, particularly for fish. People living inland needed preserved fish for fast days, especially during Lent. Herring and cod became a huge industry for fishermen around the North Atlantic and the Baltic Sea, and salt preservation became an even larger operation of factory production and shipping.

Fish could also be air-dried. In Scandinavia, the sea breeze was cold and dry, and gutted fish dried quickly on a rack. Both meat and fish could be preserved by smoking. This was the commonest method in peasant homes, where meat or fish could be soaked in brine and then hung in the smoky rafters to keep for a few months.

Cooking with salted meat or fish required multiple soaks to remove most of the saltiness and then long cooking. Recipes for salted fish must offset the saltiness with a bland flavor. **Spices,** fruit, or cream sauces helped mask the intense salt taste. Most people did not really enjoy eating preserved meat and fish, but it was the only way to maintain their diets through long winters or fasting times.

Cooking Methods

Cooking depends on what kinds of fuel and **utensils** are available. For most of Europe during most of this time, wood fires and **iron** or **copper** pots were the only cooking materials available. Northern European cooks used a nearly continual fire under a cauldron and kept the contents from one day to the next, adding what came to hand. As the southern forests of Italy were depleted by the metalworking industry, Mediterranean cooks had to use enclosed charcoal stoves and learned to make quick stovetop meals.

The most common foods were boiled: porridge, stew, and soup. A **pottery** or metal pot with a lid could be placed in hot ashes to bake, and some villages had ovens. Baked goods were primarily bread and, secondarily, pastries consisting of a crust filled with meat. Last, and most rarely, meat could be roasted over a fire; this was generally restricted to **castle** kitchens. Frying was unknown in most regions, since it required large amounts of costly cooking oil or fat.

Porridge meant any grain or nut that could be coarsely ground and boiled: wheat, rye, barley, millet, buckwheat, chestnuts, or dried peas. As the nursery rhyme about "pease porridge hot, pease porridge cold" suggests, porridge did not come to the peasant's table hot, sweetened, or with

milk, like modern oatmeal. It might be one or two days old or worse, flavored with the leftover stew that hadn't been fully cleaned from the cauldron or mixed with other foods. It was the peasant's daily food for both meals.

Brewet was the medieval name for a stew-like food—meat cooked in a cream sauce. The poorest peasants never saw brewet, but since a brewet pot could stretch a small amount of meat to feed many, it was a common food for town families. Real brewet did not include vegetables, as modern stew does, but it seems likely peasants would put anything at hand into their common stews, including beets, turnips, onions, and even field nettles. Dumplings (boiled lumps of dough) were easy to add. Soup was mostly liquid and was served with bread, called sops, to soak it up. Those who could afford better foods also made sweetened boiled puddings.

The medieval oven was heated by lighting a fire inside the main chamber. Once the oven walls were hot, the coals and ashes were raked out, and pies or lumps of bread were placed into the oven. The basic oven utensil was a wooden tool with a long handle and a flat surface for lifting and sliding the food in the oven. Although castles and manors had their own baking ovens, huts and houses in villages and towns did not have ovens large enough to bake bread, if they had ovens at all. In the early Middle Ages, before 1200, the village baker's oven had to be freestanding and built outside of town, often near a river in case of fire.

Cooking: Staple Foods of Peasant and Town

Most of our medieval sources tell what rich people ate. These are described in stories of lavish **feasts** and are preserved in recipe books written by their professional cooks. We know much less about what the poor ate. One of the few primary sources, the poem "Piers Plowman," says that when peasants are starving before harvest, they have only green (new and uncured) cheeses, curds, oat cakes, bread made of beans and bran, leeks, peas, apples, and cherries. When the harvest comes in, says the poet, they feast on wheat bread, brown ale, fish, and fresh meat. It also mentions porridge made of "milk and meal." Chaucer's *Canterbury Tales,* written around 1400, describes the diet of a poor widow: milk, brown bread, bacon, and a few eggs. In addition to the foods common to all of medieval Europe, the poor gathered wild things scorned by the rich: nettles, sorrel, lupin seeds, and other edible weeds, field mushrooms, and wild fruit.

Through most of the period, the poor ate few animal products. They could snare hares on common land, and some kept pigs. They might trap eels, and all but the very poorest could afford the cheapest salted fish. Otherwise, they lived on rye, barley, and beans. This changed during the 14th century because, after several outbreaks of **plague,** there were more animals

per surviving person. Europeans began to eat the animal-rich diet we recognize today, filled with egg, cheese, milk, and meat dishes.

Villages and towns offered bakeries, where both professional bakers and local **women** could bake their bread. The baker took a piece of dough as a fee and added it to his own batches. Dough was made from the flour at hand, usually a mix of wheat and rye. It was not leavened with brewer's yeast until the Renaissance; medieval bread was sourdough, leavened with fermented dough from the previous batch. The loaves were round, simply lumps baked on a flat shelf. They were large, heavy, and often hard; salt was expensive, so bread was not commonly salted.

Professional bakers in cities turned out more sophisticated bread products than individual or country bakers. Bread, like other foods, could be colored (yellow with saffron, green with parsley, or red with sandalwood). Loaves could be shaped into taller, flatter, braided, or twisted shapes. They could be rolled in spices or salt. Pretzels were a medieval invention; legend says they were invented in a monastic bakery and are supposed to represent praying hands. As bakeries prospered and towns grew, larger towns began to have cookshops. Here people could buy cooked food: first only cooked meat, and then a larger array of dishes.

During most of the Middle Ages, imported spices were out of reach of the common man's budget. Two pounds of nutmeg were worth the same as a cow; a pound of mace cost the same as three sheep. Common seasonings were only what could be found locally, such as onions, garlic, and garden herbs like parsley, mustard, and thyme. Mustard was the poor man's favorite spice. Salt was generally available, but the poorest could not afford salt, either. Toward the end of the Middle Ages, the cheapest imported spices became available for those of middle income. Pepper was most common, to supplement salt. Cinnamon, ginger, saffron, and cloves were at the next rung of affordability. They could be purchased by well-to-do town dwellers and were used sparingly for special dishes. Meat pies were commonly spiced, particularly pork pie.

Fruit juice and honey were the only sweeteners for anyone under the rank of prince. Even local honey was too expensive, since it was a cash crop for any peasants who might keep or find bees. The average medieval townsman or peasant did not eat sweetened food even once a year.

Recipes: Cooking for the Aristocracy

Large aristocratic houses belonging to dukes, princes, and bishops employed several cooks who had been trained in cities or in other aristocratic kitchens. In large cities, these professional cooks belonged to a **guild** that required apprenticeship for two years and then a year as a journeyman for another master cook. When they were employed in a wealthy household,

they had as many as 25 helpers, such as saucerers, larders, roasters, pottagers, bakers, spicers, and fruiterers, not to mention spit turners and scullions.

Some of these professional cooks wrote recipe collections; their reading audience was narrow, since it consisted only of other professional cooks in similar houses. In order to use these cookbooks, a cook must be literate and have access to exotic ingredients. Recipes did not explain how much of an ingredient to use because they were only notes, from one cook to another. Training and skill were assumed. A list of spices could mean they were used in pinches or in cups, and the results probably varied greatly from one cook to another. Spices were fresher or staler, depending on how long they had been shipped and stored, and every cook had to judge how piquant his spice supply remained. Without clocks, cooking times might be estimated by how long it took to say well-known prayers, such as 10 Pater Nosters, or how long it took to walk a mile.

A popular image of a castle's kitchen in which the main activity is turning venison on a spit—or a castle's feast tables, mostly loaded with roasted meat—is completely wrong. Nothing could be more different from this image than the actual cuisine of fine castles. Medieval cookery was all about difficult and impressive techniques, exotic ingredients, artificial coloring, and breathtaking showpieces to carry into the hall. Every prince or bishop wanted to impress and astonish his guest, and cooks carried their art to heights of conspicuous consumption and artificiality.

Castle cooks had access to the most expensive, rare foods. They had rice, almond milk, sugar, purest wheat, raisins, dates, exotic meats, and, most of all, spices. Every dish was centered around meat (or fish, during Lent). All exotic ingredients were put to the service of seasoning and presenting the meat in as many ways as possible. The meat itself was cooked in complicated ways, although sometimes it was merely roasted or boiled. Most recipes, though, stipulated that the meat be pre-boiled before roasting, or skinned, chopped, boiled, and restuffed into its skin, only to be roasted again. Sometimes, the same piece of meat or fish would be cooked in different ways: the head fried, the body roasted, and the tail boiled.

Cooks loved to make one food look like another. Chopped meat could be pressed into a mold, such as a turk's head, a popular turban-like shape. Foods were colored artificially so diners might not recognize what they were eating. Raisins or prunes made something black; dark green leaves provided green; grape juice or red herbs made red color. Lichen or blackberries made food blue.

Aristocratic diners dipped their roasted meat into spiced sauces and found their boiled meat floating in highly spiced brewets. In large towns, there were professional sauce makers, and, of course, castles had their own saucerers. Sauces were often vinegar based, with breadcrumbs added, or bread was soaked in vinegar and then squeezed out. Black pepper sauce

was a simple and popular sauce made from this base, with large amounts of added black pepper. Cameline sauce used large amounts of ginger, cinnamon, and garlic and perhaps other spices such as mace, pepper, and cardamom. There were also yellow sauces based on ginger and saffron and green sauces of green herbs with ginger, cloves, and cardamom. Pieces of meat came to a medieval table floating in green, yellow, or black sauce that tasted like cinnamon, ginger, or pepper. Almost nothing on an aristocratic table tasted like the original meat.

There were other dishes to accompany the meat. Frumenty was a thick boiled pudding made of wheat flour and almond milk. It sometimes included egg yolks or was seasoned with saffron, sugar, or salt, or it could be made with finely ground chicken or rice. It was a common accompaniment for venison. Rissoles, another side dish, were made of chopped meat, fish, or even fruit mixed with spices and flour and rolled into balls and fried. They were served piled onto a platter, with a spicy sauce poured over them.

A staple of the castle kitchen was the pie, usually made with chopped pork. One medieval recipe directs the cook to mix the pork with egg yolks; sauté pine nuts and currants with ginger, cinnamon, saffron, sugar, and salt; and then put all the ingredients into the piecrust. The top crust was decorated with nuts, currants, and egg yolks. Similar meat pies would have been served in castles all over Europe.

During the 40 days of Lent, when no meat could be served, wealthy diners grew tired of salted fish. Cooks varied the menu with imitation meat dishes. Fish or fish eggs were chopped and pressed into molds like meat or funneled into blown egg yolks. Because meats like pork and venison were so heavily associated with spices like cinnamon and ginger, cooks could serve fish rissoles with cinnamon sauce, and the diners would exclaim they tasted just like meat rissoles. Ground fish, baked in a mold, went into cameline sauce to fool the diners into believing, for a moment, that it was venison.

While there were some fruit dishes, such as fruit puddings, tarts, and fritters, a medieval diner would never expect apple pie for dessert. One reason for the heavy spicing of each meal was that it was considered medically necessary, and so a proper meal closed with even more spices. Candied ginger or cloves, and whole nutmegs, also boiled in **sugar** syrup to candy them, were the most common desserts. Exotic fruits, such as oranges, figs, dates, and pomegranates, also could be candied and spiced. A properly healthy meal must close with hot, spicy sweets.

Regional Differences

At the beginning of the Middle Ages, there were enormous differences between regional cuisines. The olives and vegetables of the Mediterranean,

the spices of Muslim Spain, and the heavy meats and butter of Northern Europe bore no relationship to each other. As wealth and trade increased, regional foods spread, either as transplanted farm products or as goods transported to market. Regional recipes traveled into other regions, at least among the upper classes. British cookbooks of the 14th century explain how to make ravioli, lasagna, and classic Arab dishes. Spices traveled widely and influenced the regions to share tastes.

Medieval Spain was dominated by the Arab culture of Andalusia. Muslim food followed rules of halal—the rules set down by Mohammed about what foods could be eaten. Pork, blood, improperly slaughtered animals, and alcoholic drinks were not halal. Beyond these rules, the dietary likes and dislikes of the Prophet became a secondary rule, since Muslims wished to imitate him as closely as possible. He was a desert Arab who had eaten a restricted diet. His favorite food was a meat stew thickened with breadcrumbs, which became the center of many Islamic recipes that added new ingredients to the original concept. Mohammed also loved sweets, when they were available, so Islamic cooking did not scorn to use honey, dates, and sugar. The Christian ideal of self-denial was not a Muslim ideal. Medieval Muslims were advanced in the development of sweets; they worked more with refining sugar, and they invented caramel, nougat, marzipan, sweetened fruit juice, cake, and the deep-fried sweet dough that became Italian cannoli and carnival funnel cakes.

Muslims also used the art of pickling and pickled not only cucumbers but also turnips, beans, and even locusts. Pickles, yogurt, and spicy sauces were common condiments. Fish was very popular in Andalusia, although it was harder to obtain in Baghdad, the center of Islamic culture.

Christian culture was concentrated in the north of Spain, along the Pyrenees mountains, and it spread south as the Arabs were gradually defeated. Christian Spain's cooking was influenced by Arab traditions and the sea. Recipes were heavier on fish and seafood than in other parts of Europe. Like other Mediterranean regions, Andalusian and Catalonian cooking also used more vegetables than did Northern European.

Medieval Italy did not yet have the tomatoes we now associate with Italian food, although even the poor ate more vegetables, more bread, and less porridge than in Northern Europe. But pasta, the signature food of Italy, has its roots in the Middle Ages. Some claim that Marco Polo brought pasta back from China, while others say it was a native invention of Italy. Early pasta was simply dried unleavened dough, brought back to eating texture with boiling water, and sometimes baked or fried afterward. Pasta could be small hand-rolled balls of dough or rolled-out flat shapes. By the 12th century, Italian manufacturers in Sicily, Sardinia, Pisa, and Genoa were drying pasta for later use and selling it dry.

In the 13th century, written references speak of lasagna and vermicelli (little worms). In the next century, we read of meat-stuffed pasta, even then called ravioli, which were deep-fried or boiled in broth. Even simpler, "tortelli in the Assisi manner" were just chopped meat rolled in flour, which created a thin noodle-like cover when boiled. Cheese ravioli developed for fast days when meat was prohibited. An illustration from around 1400 shows women making pasta at home; they have rolled and cut the dough and are drying it in tiny strips on a wooden rack, the way modern home kitchens would make pasta.

France's cuisine divided into north and south, and the key dividing line was the use of oil, rather than butter, in cooking. Northern France was a dairy-producing butter economy, while Southern France was dominated by the Mediterranean and centered around olive oil. Southern France's recipes also used oranges and pomegranates. The signature dish of Northern France was the brewet, or brouet, made with broth, pieces of meat or fish, and spices. French aristocrats seemed to eat raw fruit, according to household records, but there were few recipes for cooked fruit. German and Polish food was similar to other Northern European food but focused more on roasts and pies and less on sauces.

English cuisine was somewhat isolated and distinctive. It used local flowers and flavors, and it used wheat flour as a thickener for sauces, while French cuisine did not. Because spices were even more expensive in England than in France, English recipes used fewer of them and leaned more on the most common: pepper, cinnamon, and ginger. The English had many recipes for cooked fruit and also favored meat pastries. Recipes for aristocratic tables did more with changing the food's appearance by grinding, blending, shaping, and coloring it. Food could be brightly and artificially colored red, blue, yellow, or green. Egg glazes made food shiny.

See also: Beverages, Fasts, Feasts, Gardens, Kitchen Utensils, Medicine, Spices and Sugar.

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Forests

Europe was heavily forested at the beginning of the Middle Ages. The majority of its forests were made up of broad-leaved trees that only grow in a temperate zone. These trees grew north of the Mediterranean lands, where summers were too hot and dry, and as far north as Denmark and southern Sweden. Some broad-leaved trees grew fairly high into the foothills of the Alps on the south-facing mountain slopes. France, Germany, Poland, England, the Netherlands, and Denmark were all forested with oak, ash, beech, chestnut, and, to the north, birch. Near running water, there were willow and poplar; on well-drained land were found maple, sycamore, and elm.

At higher altitudes and in northern Scandinavia, there were also conifer forests. The conifer that sheds its needles every year, the larch, grew in the Alps. Northern Norway and Sweden had spruce forests; silver firs and Scots pines were the other typical trees of cold elevations.

Mediterranean forests had been diminished before the Middle Ages by widespread goat farming, because goats eat young tree shoots. Trees that grew well in this hot climate had thick waxy leaves, thick bark, or dense wood. The evergreen oak, the cork oak, and holly have these traits. They are more flammable than northern trees, more at risk for forest fires. Cyprus, maritime pine, and rhododendron had similar features for the dry **climate.** Most forests in this region were made of shrubs such as laurel and oleander and pines like the maritime and stone pine, whose nuts are edible. The shrubs had thick, oily leaves and were good for perfume and seasoning; they included rosemary, thyme, sage, and lavender. The Mediterranean region also had ancient orchards of olive trees.

Trees were both an asset and a problem. They were a source of lumber, but they also covered land that could be used for farming. Broad-leaved trees grew in better soil, so settlers usually cut them down first in order to create fields. Conifer woods grew on poor soil and were only cut for timber.

One way peasants managed local deciduous forests for firewood was to cut off a tree's branches, while leaving the trunk alone, so it would produce more limbs in the next few years. This practice is called coppicing. Coppicing produced many small branches that were suitable for poles, fences, and firewood, but not for serious building. A tree stump could be kept alive, producing shoots, for a century or more. As an alternative in a deer park, a tree could be coppiced at a height above where a deer could graze. This produced a much taller stump with shoots and was called pollarding.

Hunting in the Forest

The character of the English forest changed with the Norman conquest of England in 1066. Norman kings considered the forest's resources of **hunting** and wood to be theirs, and they passed strict laws about forest use. Only the king's servants could cut wood there, and only the lord and his friends could hunt there. Peasants were punished severely, including death and mutilation, if they were caught poaching animals or wood. Even fallen wood lying on the ground was kept from their use. The law was enforced by a warden who employed foresters, rangers, and surveyors. They reported violations of cutting down trees to create new fields (assarting) and poaching. Gradually, the Norman kings began leasing some of their many tracts of forest to barons, but the forests remained off limits to the people who lived in and around them.

The Magna Carta of 1215 had five clauses that addressed these abuses of royal power in the forests. It forced King John to give back forests he had appropriated, as well as forests seized by his brother or father. It assigned a jury of **knights** in each county to hear forest cases. In 1217, John's son Henry III signed a new Charter of the Forest that permitted aristocrats other than the king to hunt in the forests. It abolished the death penalty for poaching. While commoners were still not supposed to hunt in the forests, the penalties became less severe through the 13th and 14th centuries.

The stories of **Robin Hood** and other outlaws flourished in these centuries. The royal forests were shrinking, and some villages and towns had been permitted to grow inside them. Pockets of deep forest existed just off the road in many places. Some of these original medieval forests are still in existence: Epping Forest, the New Forest, and the Forest of Dean. Sherwood

Forest was a small forest in southern Yorkshire, and Robin Hood's legendary range included the towns and countryside north to Barnsdale. The northern forests were all less settled than the forests in England's Home Counties to the south. Outlaws and highwaymen operated in many of these thick forests.

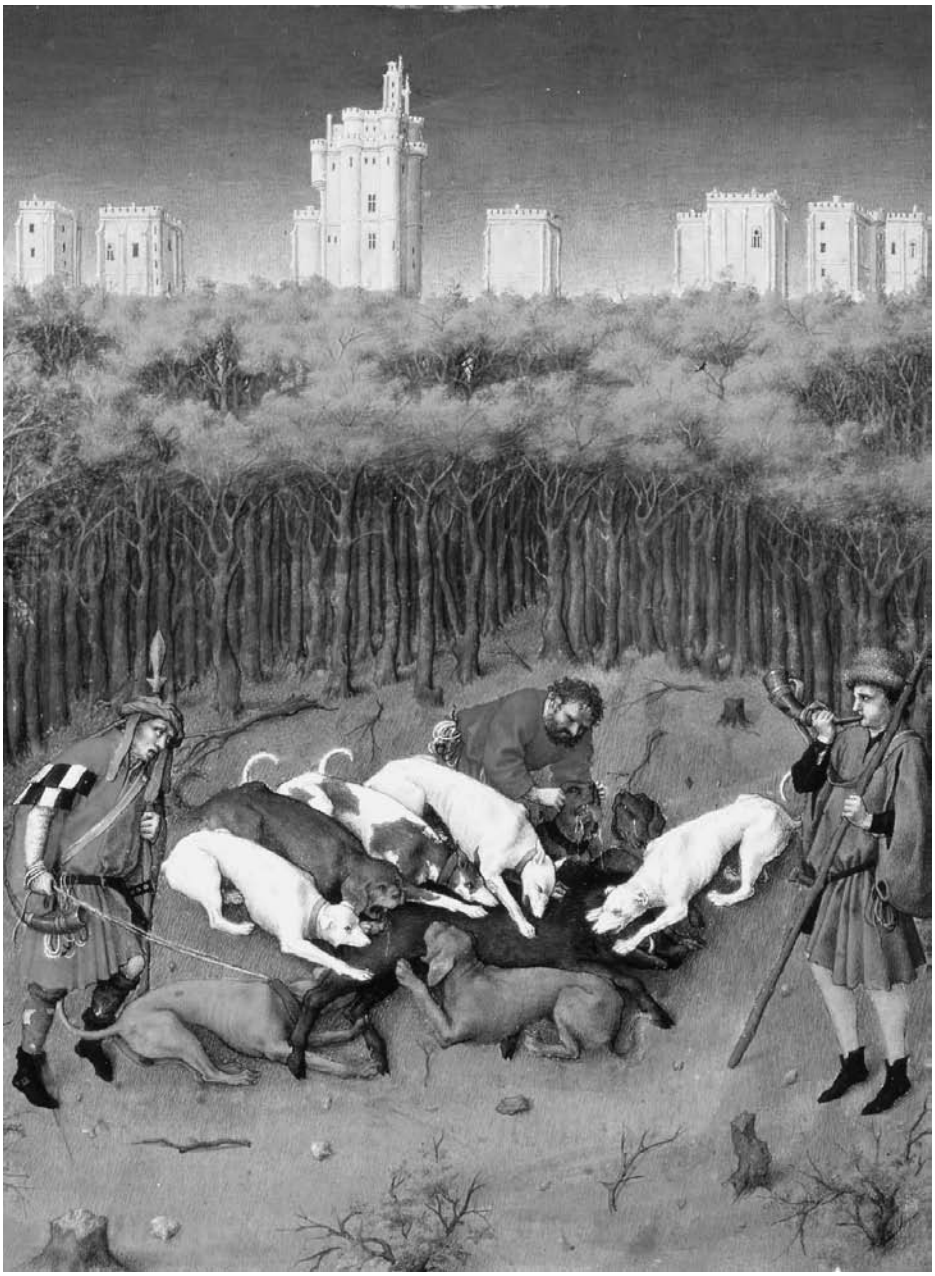
Small forests could be enclosed, with labor and expense, so that the game that lived in them was less likely to wander off. Enclosed forests were called parks. Many parks were enclosed during the 13th century, since the human population was rising and the cost of firewood was skyrocketing. Landowners wanted to protect their woods from being cut or hunted. The park could be enclosed with a ditch, a fence, or a hedge. The easiest combination was a hedge at the top of a ditch so that any escaping animals had a very long drop-off to negotiate. Hedges could also be combined with dead branches and posts to fill in gaps and create a solid wall. Most parks in England were less than 500 acres in extent, but they were scattered all through the countryside and cramped the expansion of farms.

Parks were not usually connected to a manor or castle or its immediate surrounding garden. In later times, houses were built in the parks, but, in the Middle Ages, parks were outlying pieces of land, not developed for farming, and were enclosed simply to preserve wood and hunting animals. Enclosing a park normally blocked others from using it, but the owner could lease rights for limited use to neighbors. Manorial park records show payments for rights to graze pigs on acorns, to graze cattle on the grass of meadows, and to collect and sell fallen timber as firewood. The lords who owned these manorial parks could use them for recreational hunting, but they also sent professional hunters who brought back food without fanfare.

Some parks were carefully managed as deer breeding grounds and had park keepers (called parkers) on staff. The largest parks had small lodges for the parkers to live in. The Normans imported a breed of Mediterranean deer, the small fallow deer, and carefully stocked their forests with them. There are records of kings and lords sending each other small herds of deer to start new populations. The parker was responsible for making sure the deer had enough grass, tree leaves, or hay. Hay might be spread on feeding racks to keep it out of winter snows, and sometimes park keepers built simple sheds to shelter the deer or their food. The deer needed the least interference during their fall mating and spring fawning seasons. Parkers were to leave them alone and not attempt to collect dung. They also maintained the boundary hedges and ditches and watched for poachers.

Lumber and Firewood

Timber for construction was felled in midsummer, fall, and winter because the wood was inferior if it was cut in early spring when the sap was



Deep in the forest, a hunting team has brought a boar to bay. The dogs' teeth and the men's spears will finally subdue the most dangerous hunting quarry. Some wild virgin forests served as hunting lands for royalty, while other forests were tamed into parks. The parks were controlled forests stocked with animals that the owners wished to see and hunt. (Réunion des Musées Nationaux/Art Resource, NY)

running. Unseasoned lumber was used for structural building; they cut and used it immediately. Many medieval structures show signs of the beams shrinking with time, leaving gaps between boards that were originally flush. Seasoned timber was more expensive since it had to be stored for a year. It was better for fine carpentry, such as making wooden vaults or **furniture.**

Oak was the first choice of lumber for general construction and cabinet making. Elm and beech were second, with beech as the best choice for cutting thin boards. Alder, ash, poplar, and willow were mostly used for scaffolding and wattle. Every kind of wood had its own properties and uses, and many objects made of wood used three or four types. **Cart** wheels had oak spokes, elm hubs, beech felloes, and ash strakes.

The largest building projects required enormous timbers from the tallest, oldest trees. **Ships, castle** fortifications, **bridges,** and support beams in **cathedrals** forced foresters to search for the tallest, thickest trees. By the late Middle Ages, such trees were gone from the heartland of Europe. England began importing tall spruce trees from Norway in the 13th century.

Wood was fuel for any industry that required fires: baking, **iron** smelting, **glass** making, and many more. Most crafts used a great deal of fire. Wood also provided bark for the chemicals needed to tan leather.

The iron industry was especially hard on forests because raw wood was not rich enough in carbon to raise the temperature of the fire. Wood had to be slowly burned into charcoal first. Since the raw material of trees had to be reduced to charcoal, and then the raw material of the iron ore had to be reduced to true iron, a forge burned through forests very fast to produce the lumps of iron that were increasingly necessary for every other industry. In the English Forest of Dean, the regional capital of the iron industry, the king had to outlaw any but royal forges.

The forests of Europe vanished rapidly under this pressure; one forge could burn through over 100 oaks in a year. The price of wood rose, and it became hard for the poor to afford wood for fuel or building. Some regions began to put bans on forest cutting, and some began to require tree planting. The enclosure of wooded areas as managed parks helped somewhat, but it also raised the price of materials that used to be free. Park managers could sell fresh lumber, fallen branches, charcoal, bundles of twigs known as faggots, and even tree bark for its tannin.

See also: Furniture, Robin Hood, Hunting, Iron.

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Fountains. *See* Gardens

Fresco. *See* Painting

Funerals

Funeral customs are almost invariable within a time and place but vary greatly by social class. Funerals can be great displays of wealth and power. In medieval Europe, we do not have strong **records** of funeral customs in all times and places. We see mostly aristocratic burials that lasted through the ages and mass burials in times of crisis. We have records of funeral rites but not often of local funeral customs. Our knowledge of medieval funerals is patchy; for some times and places we know a lot, and for some, very little.

The Germanic tribes who invaded Europe at the beginning of the Middle Ages made funeral pyres to symbolize the dead person's spirit flying upward. The Norse continued to make funeral pyres until they adopted Christianity after 1000. Although funeral pyres did not leave behind objects for archeologists to find, some Anglo-Saxon and Norse literature describes these pyres in detail.

The pagan Franks, Anglo-Saxons, and Danes also buried bodies in graves or tombs. Kings were buried in rows, with a number of grave goods. The most opulent burials required a hole large enough to hold a **ship.** The ship was filled with **weapons** and supplies for the dead man's afterlife, and then a timber roof was constructed over it. When the corpse had been laid to rest in state on the ship's deck, they covered the whole with a mound of dirt. Some graves like this were robbed, but a few have been found undisturbed, such as the ship burial at Sutton Hoo, England. Much of what we know about the material culture of the pre-Christian Germanic people comes from these rich burials. Weapons, cups, and **tools** found in graves are museum objects now.

Judeo-Christian custom was to bury bodies in a tomb or grave cut from rock or under the ground. Bodies were always washed and then wrapped in a **cloth** shroud. Some cultures with access to wood used coffins, but the body was often removed from the coffin, which served only for transportation to the gravesite. At times, coffins could have been household storage chests that happened to be an appropriate size, especially in the burial of a child. Medieval Christians did not bury bodies with grave goods, with a few exceptions. Priests, especially at the top of the hierarchy, were sometimes buried with their symbols of office, such as crosses, chalices, or rings. Medieval French peasants sometimes buried a man with a few of his tools.

Black became the color of mourning only in the late Middle Ages. In earlier times, white was a color of mourning; more often, there was no official color and people had only their ordinary garments for a funeral. People paid for their own funerals, but many died without the means for a proper ritual. Either the **church** gave them a minimal burial or a wealthier benefactor paid for a pauper's funeral. Craft **guilds** sometimes directed the burial of a member. The guild members formed a procession to the grave, and some people specified in their will that they wanted others to participate. The members of a religious order might be requested, for example. In the late Middle Ages, particularly after the **plague**'s devastation, people joined burial societies that pledged to make sure the members were decently interred, even in the event of another plague.

Typical Medieval Burials

Funerals in **monasteries** followed a set of written rules that give us some idea of what was deemed appropriate in the time, whereas funerals for lay people are mostly undocumented. A dying monk first confessed his sins to the community and received absolution (forgiveness) and communion for the last time while the monks chanted Psalms. Attendants watched over his death with a cross and candles. Once dead, he was placed on sackcloth and ashes, and the monks gathered to recite prayers and then went into the chapel to say a Mass for the soul of the dead man. The body was washed and dressed and its hands clasped, as if in prayer. During the night, monks took turns in three watches, singing Psalms in between other prayer or Mass hours. The body lay in the church until morning, after Mass, at which point they buried the body in a dug grave. Most of the emphasis was not on the body itself, but on the prayers and services to be said for the departed soul. The burial itself was very simple.

For burials outside monasteries, the ritual must have varied much more by region. Most regions left few or no records, and little can be determined by excavations. Most of what we know comes from a few royal burials, a few burials recorded in literature near the end of the Middle Ages, and some late medieval household records and wills that set out the funeral plans of the deceased.

The most important step began before the person had died. This was the ritual of extreme unction, the last confession before death. Legally, a man was dead after this ritual, so it was not performed unless the family was very sure death was coming. In some places, if a person recovered after these last rites, he was required to **fast** and go barefoot. Yet it was considered catastrophic to die without extreme unction, so people made great efforts to

An illustrated miniature represents the stages of a church funeral. First, the body was wrapped in a shroud (foreground). In the back, to the right, the body has been placed in a draped coffin. Monks and paupers (who were paid for their services) pray over the coffin before the burial. A choir, left, sings the psalms over the body. Once these ministrations had helped the deceased man's spirit on its journey to heaven, the body would be buried fairly simply, in its shroud, usually without a marker. (E&E Image Library/StockphotoPro)

have a priest nearby. If a woman died in childbirth, sometimes it was permitted for her to confess her sin to the midwife or relatives nearby if the priest could not come in time.

In most cases, the person's will was made at this time, shortly before death. The will sometimes stipulated points about the burial, but mostly it directed distribution of goods like **animals,** land, and **furniture.** Wills were not required in the early Middle Ages and only became routine in the 14th and 15th centuries.

Gifts to the poor were a large part of a person's last will and testament. The poor understood they were to take part in the funeral and pray for the soul of the departed, and people believed the prayers of the poor and sick were more effective. These bequests took many forms. A will might leave funds to provide **shoes** or **clothing** to a dozen or more poor people or for a home for orphans. Sometimes money went to the poor so they would attend the funeral, perhaps carrying torches, so the size of the funeral was

often an indication of the person's wealth and charitable generosity. Donated clothing was given before the procession so the paupers could wear it as a uniform for the occasion. After the funeral, the executors of the will provided food for the attendants.

There was usually a period when the body lay, either at home or at church, for the public to see. In the case of important men, it may have been for several days so their deaths became publicly known and nobody could claim they were alive. Royal corpses were in public viewing for weeks.

The more important a person, the more elaborate the funeral. The body could lie in state at home or in church for more days, surrounded by more candles (purchased by the deceased's estate). The church was draped in black by the 15th century, and the cloth was another cost. More **bells** were rung; for an important person, the church bells might toll for half an hour, and for a poor person, only a few times. Along with the ringing of church bells, sometimes the bede was paid to go about town, ringing a bell and asking people to pray for the departed soul. The coffin (purchased by the deceased, if he was wealthy enough) might be covered with a decorated pall while it was in the church. More Masses were said, and there would often be memorial sermons and prayers on anniversaries of the death. Masses and the services of a priest were not directly paid for and were technically free, but, customarily, they were the result of donations. All these elements cost money, and the cost of funerals varied widely. A monk or servant might be buried for a few pennies and a prince for several hundred pounds. When a guild helped with an impoverished member's funeral, they probably chose a modestly reasonable funeral—enough for the dignity of the guild but not for showy display.

By the end of the Middle Ages, some records show that large meals were served after English funerals. The meal may have been served at the church or at the deceased's home. A distinction was made between the poor, who only attended out of charity, and the priests and guests of honor. The poor were served bread and cheese, or cheaper cuts of meat, while the priests and wealthy friends and relatives dined on meat pies and other meat dishes. In late medieval England, those who could afford it had a memorial service one month after the burial, and this too included a meal, a procession, gifts to the poor, and candles.

Bodies were not usually buried with clothes, since clothes were expensive and were usually left to relatives in a will. Only the wealthiest were buried with clothes; bishops were buried with their robes, croziers, and rings. Sometimes pilgrims were buried in their pilgrim clothes and shoes, as if to honor their traveling status in life. In Germany, the deceased were often buried with shoes, so they would have shoes on to run to meet Christ when they were resurrected. This may have been customary in other parts of Europe; there is little evidence.

The body was laid to rest in a consecrated cemetery. It was usually by the church and was distinguished by the rituals of blessing that set it apart for Christian burial. Crosses marked the corners, there was a tall cross in the center, and a bishop had blessed it with holy water during its consecration. Medieval people believed souls could not go to heaven if their bodies were laid to rest in unhallowed ground. Certain groups were excluded from proper burial in a churchyard: suicides (unless they were known to have been insane), those who died in **tournaments,** those who had been excommunicated and never repented, or those who were known to be in chronic, public sin, such as money lending for profit. Since the conviction of suicide also meant loss of property to the Crown, local priests and juries tended not to rule deaths as suicides, permitting proper burial. The laws against suicide became stricter after the Middle Ages. In spite of the rules, most people had proper churchyard burials.

Gravediggers dug a pit for the body to be interred, and they were paid for their services by the deceased's estate. The custom that evolved in Europe during the Middle Ages was to orient the grave in an east-west line and to place the deceased's head to the west so he or she was looking toward the east. This was the direction where people expected the Second Coming of Jesus to take place, so the dead were placed in watchful waiting. During the early Middle Ages and through the 12th century, some graves were lined with charcoal or chalk. Some of these burials also had stones as pillows for the deceased, and it is possible that the stones and charcoal were signs of humble repentance.

Because the churchyard had limited space, grave sites had to be used more than once. Bodies were not often buried with markers. Over time, the cloth shroud and the flesh rotted, leaving only bones. After a period of years, the cemetery would be filled, and it would be leveled and new grave sites would be marked out. When gravediggers found old bones, they put them into the charnel house connected to the cemetery and church. Some English medieval cemeteries have been reused eight or nine times, as excavation can show by the apparent jumble of graves.

Christian priests were buried inside churches, under the floor or in a crypt in the cellar. The church was the most consecrated place, and the bones of a priest were thought to make it holier, like **saints' relics.** Princes and kings were buried in the **cathedrals** and chapels they had endowed. Kings of France were buried in the Abbey of Saint Denis, and King Henry III began a tradition of English royal burials in Westminster Abbey.

Toward the late Middle Ages, wealthy people who had paid for a chapel or church were often buried inside it. Memorial chapels were endowed so that prayers for the soul of the deceased would be said in perpetuity, or at least for some years. Some memorial chapels were side rooms in a larger church while others were small churches on an estate, perhaps attached to

The new availability of brass made affordable picture memorials very popular for the lower aristocracy and wealthy merchants. Although faces were probably represented only approximately, brass engravers were meticulous in recording details of armor and clothing. Much of what we know about human appearance in the late Middle Ages comes from memorial brasses. (Duncan Walker/iStockphoto)

a house. These indoor graves often had brass plaques engraved with a likeness of the deceased as a memorial. Memorial brasses were a dominant art form by the 14th and 15th centuries, and every family that could afford them had brasses for every member. The engravings showed the deceased in a pious position, standing or kneeling in prayer, and many are done with careful attention to clothing, especially to the family's coat of arms.

Atypical Medieval Burials

Not all burials followed these standards. There were exceptions toward both more ritual and less. The aristocracy, especially royalty, needed special treatment. At other times, such as during an epidemic, ritual could not be kept up.

One of the first examples of embalming in Europe was the burial of King Charlemagne. His body was packed with **spices** and buried in the crypt at his cathedral in Aachen. He was fully robed and seated on a golden chair. The tomb was packed with more spices and perfumes. A descendant who entered the tomb 100 years later found the king's body still seated on his chair, partially preserved.

Aristocrats were more likely to die when they were far from home, and they sometimes left unusual instructions for getting their body back to the

home cemetery. Sometimes they were embalmed, like Charlemagne, and sometimes they were dismembered. Sometimes only the heart came home, encased in a lead box. King Baldwin I, the **Crusader** ruler of Jerusalem, died on campaign in Egypt and gave his cook directions for preparing his body to make the journey back to Jerusalem. The cook gutted him of his internal organs, salted the body inside and out, and seasoned his eyes, nose, ears, and mouth with balsam and other spices. The body was rolled in a large cloth and carried safely back for burial.

Embalming and dismembering could be done for reasons other than travel. Aristocrats were more likely to be laid out for public viewing, lest there be any mistake they were really dead. **Salt,** wine, and vinegar had some preservative effect, but imported spices like cinnamon and pepper worked better. The longer the body was to be displayed, the more embalming was required. King Edward I of England was displayed for four months in 1307. Royal burials were expensive and showy. Spice embalming was fantastically expensive, and therefore it was another way to display wealth and power.

In the later Middle Ages, the price of spices began to drop. Minor noblemen and even wealthy craftsmen could afford to buy them for their kitchens, and the lesser nobility began to embalm bodies with ginger, cinnamon, and cloves. Embalming may have been increasingly necessary as more people were buried in chapels.

Nobles and kings were sometimes not only embalmed, but also dismembered and buried in pieces. One obvious application of this custom was for conveying some of the deceased home from a journey, such as a Crusade. But, in other cases, members of the nobility asked to have themselves buried in different places. This way, they didn't have to choose one place. Their heart could be buried in one monastery, their entrails in another, and their body in the royal cathedral. The official church did not like this practice; Pope Boniface VIII condemned dismemberment as barbaric and shocking. His successor, however, found a way to sell licenses for permission to the nobility.

Epidemics and famines disrupted customs, especially when the death rate passed 10 percent. The worst was the Black Death **plague** during 1347–1352. It was heavily documented, especially in Italy, where **paper** was more available and many people were literate. Funeral customs were at first attempted but then abandoned as the number of deaths increased. In a proper funeral in Florence, female relatives and neighbors gathered at the deceased's house to mourn with the family. Men gathered at the front door for the funeral procession, along with priests. They carried the corpse to the church on a bier, on their shoulders, while singing dirges and carrying candles. After a funeral Mass, the body was laid to rest in the churchyard. A really fine Florentine funeral display was more elaborate and expensive.

The funeral parade included banners showing the wealthy deceased man's many achievements and distinctions and incorporated men on horseback as well as marchers.

During the plague, however, it became difficult to carry out the simplest rituals. With whole families dying rapidly, there was nobody left to mourn, and it was difficult to find people to carry the bier. Priests, too, were dying. By the peak of the plague, the city tried to maintain a service of removing corpses for mass burials. Venice's canal boat **garbage** removal service was successfully put to use to carry away corpses. Bishops were reluctant to consecrate new cemeteries, and some people began to use unconsecrated land. The church finally blessed fields, and gravediggers began to make very large pits. When the bodies piled up too fast, some were covered with ash overnight.

Some communities became too disorganized to do more than bury the bodies, but others maintained a mass ritual decorum as they could. In London, even at the height of the plague, bodies were still laid in order, heads to the west. In country cemeteries, families buried their dead on consecrated land, but they were forced to use common pits, and no ritual could be observed when so many were dying at once.

See also: Beggars, Church, Guilds, Plague, Relics, Spices and Sugar.

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Furniture

The Middle Ages did not put as much emphasis on furniture as later times did. Furniture was simple and very durable; it was handed down to the next generation and was rarely made or bought new. There were four basic furniture functions: tables, chairs, beds, and storage chests. While furniture styles varied some by region or across the period, there was not much innovation.

Chairs were not common in the Middle Ages. Stools were the most common type of seating; peasant **houses** were likely to have a few basic stools. Benches were also very common, since they could seat many people at once. A manor hall typically had a number of benches that could be moved to the side of the room or set up for a **feast.** They also doubled as beds, if needed.

A real chair with a back and arms was a mark of distinction and was usually owned only by the lord of a manor or castle or the bishop or abbot of a monastery. Some medieval chairs still in existence are shaped like a barrel, with round backs and arms above a solid base. Another popular style in the late Middle Ages was a chair resting on legs that cross, as though the chair might be able to fold. The Latin name of the chair was *faldistorium,* and it is sometimes called a scissor-chair. Some of these chairs had no back and may have been able to fold, while others only copied this style. Some had a wooden seat and back, while others had a **cloth** seat and back so they could actually fold. The scissor-chair appears to have been used only by royalty or by bishops.

Since chairs were a luxury item, they were rarely plain. They were heavily carved and frequently painted; the look of natural wood was not prized in the medieval period. The greatest chair was a throne for a king or bishop. The word **cathedral** came from the Latin term for the bishop's throne, the *cathedra*. Thrones were carved, painted, gilded, and padded with velvet or embroidered cushions. Some thrones and throne-like tall chairs had a safe built into the box below the seat.

Very few pieces of medieval furniture survived into the present. As furniture manufacture improved, nearly all of the crude medieval pieces were recycled or destroyed. Only well-made, remarkable pieces, such as this scissor chair, were kept long enough to join modern museum collections. The scissor chair was originally designed to fold, but most medieval ones did not. They were painted, gold-leafed, and upholstered. (*Architectural Record* 7, no. 1 [1897]: 435)

Tables were often portable and consisted of a board on trestles. **Paintings** of feasts show clearly that the tables were resting on angled, crossed legs, rather than straight ones like modern tables. In a **castle** or manor hall, they could be set up and taken down as the size of the dining group changed. In the 15th century, some feast tables were designed to fold; the legs were not trestles, but the table could be stored in a side room. The key point for a medieval table was to be rectangular and long so the hierarchy of the diners was plain. At a feast, there was a high table and subordinate tables, and etiquette dictated where each diner sat. The high table was the only permanent, or dormant, table in the room.

In the later Middle Ages, there were some small occasional tables for the wealthy. Paintings from the 15th century show small parties of diners at square or round tables, as well as small round tables as furniture in other rooms. Some stand on a single pedestal, and others have three legs. The 15th-century round tables that survived into the present include some with marble tops. Round tables, though, were not common for dining. They implied equality, rather than hierarchy. Some medieval paintings show both Jesus and **King Arthur** eating at round tables with their followers, and the message was clear to medieval viewers that these two great men were showing the others equal honors, instead of sitting at a high table. **Inns** and **taverns** may have begun using round tables before private houses, since travelers did not know their social standing with each other, and a round table encouraged them to sit anywhere.

Some functional rooms had worktables that were not on trestles. A well-equipped medieval kitchen had a heavy table. Workshops, too, had sturdy tables. The lack of tables in a house may have been caused less by a lack of tables than by a lack of space. In a room that might shift its purpose according to season and time of day, permanent furniture was in the way.

In the early Middle Ages, peasant beds were usually made on a sack of straw. The sacks could be moved during the day, and it was easy to make an extra bed if there was enough straw. Straw mattresses could be laid out on benches or on the floor. Early Anglo-Saxon beds were wooden boxes made to hold the straw mattress. In a castle, knights in attendance on the lord may have used the hall's benches for beds. *Beowulf* mentions that pillows were stored in chests and brought out to turn the benches into beds. While a bench may sound like a very narrow bed, pictures of medieval beds are always surprisingly narrow to modern eyes. A bed that looks large enough for one will usually show two sleeping without much space to move around.

Images of later Norman-era beds owned by nobles suggest wooden beds that looked similar to modern beds, with a head and foot and perhaps knobs on the posts. As the middle class grew, simple wooden beds for straw pallets became more common. At no time was it taken for granted that everyone had a real bed. Beds were often the most expensive thing a person

owned, and they are usually mentioned in a will. If a bed is not specifically given to a surviving spouse, child, friend, or **hospital,** there probably was no freestanding bed. In some regions, beds were built into the walls, with shutters or curtains.

Later medieval beds were often larger and grander. In the 13th century and later, the beds pictured were four-posters made of wood and were almost always curtained for warmth and privacy. They had interlaced rope springs and a straw mattress, which for nobility had a layer of feathers. Beds had linen sheets, wool blankets, many pillows, and sometimes fur comforters. The earliest curtained beds did not have real canopies, but only ropes or rods attached to the walls or posts for the curtains. By the 15th century, grand beds had wooden frames above to hold the decorative curtains. When the owners of such beds traveled to their other castles and manors, they carried much of their furniture along. Stools and chests easily packed into the **wagons,** as did the bed's mattress, sheets, and curtains. The wooden bedstead probably stayed in the closed-up house; the cloth items were more expensive and easier to steal.

Houses did not have closets built into the walls. Clothes were stored in chests or hung on pegs. Chests were heavy and wooden and came in all sizes, usually with **locks**. Large chests stored blankets; medium chests stored clothing or furs. Small chests, also called coffers, stored personal possessions or jewels. Chests were often carved and painted brightly. Large chests doubled as benches in a chamber or hall. Most houses had a number of chests, and even peasant houses probably had at least one.

Luxurious city houses had other pieces that were not known to most homes. A cupboard was a storage chest on legs with doors that opened at the front. It was usually carved and painted; placed in the main hall, it could display fine **pottery** and **glass.** A writing table in the hall or in a chamber permitted a scholar or businessman to work. Portable chandeliers provided evening light for those who could afford candles. Bookshelves may have been the ultimate luxury furniture, since few individuals owned **books** at all.

House furnishings also included many cloth items. Floors were never carpeted outside of royal bedchambers, but imported carpets from the Middle East were hung on walls. Although windows were normally fitted with shutters, some city houses with glass windows used cloth curtains. Beds had curtains as well as sheets and blankets, and benches and chests often had cushions. For bathing and washing, there were linen towels hung on pegs and rods. Houses above the poverty level covered dining tables with white tablecloths. Walls were covered with painted fabric hangings, or **tapestries** when they could afford them.

See also: Houses, Kitchen Utensils, Lights, Tapestry.

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G

Games

Games appear in the medieval **record** mostly in illustrations of daily life, such as in illustrated Psalters and **calendars.** We see children, teenage boys, and ladies playing outdoor games of chase and tag. Other pictures show men and **women** using board games or dice. A wide variety of games and sports were played all over medieval Europe.

Gambling and Board Games

Medieval men used dice for gambling games. Dice had originated as knuckle bones tossed in games of chance, but, by the early Middle Ages, cubic dice with points were common. These dice were also made from bone, but they were carved into cubes with the familiar modern arrangements of dots burned into their sides with small branding irons. They also tossed **coins;** in England, the sides of a penny were called cross and pile.

Playing cards came to Europe around 1400. They may have come from India through **Muslim** Spain. The first cards were hand painted and only royalty could afford them. Early woodcut **printing** techniques made cheaper cards available, and, by the middle of the 15th century, cards were in common use even in England. There were two kinds, tarot cards and playing cards, but we know little about how they were used. Cards did not survive the ages well, since most were made of **parchment** or **paper.** Surviving cards tend to be tarot decks with extra non-gaming figures included, such as the Hanged Man, Death, and the Pope. Playing cards seem to have used some figures still used today, such as kings and queens made of two heads joined at the middle, rather than a full body. A 15th-century Italian sermon mentioned other card figures: coins, cups, swords, and clubs.

There were several basic board games, and they seem to have been very popular both at court and in city **taverns.** There were a few basic board layouts, and different games could be played on the same board. In medieval times, the checkerboard board was used for both chess and a game called draughts, which was similar to checkers. They also used the backgammon board and another board with diagonal lines connected to dots.

Chess originated in Muslim India; it came to Europe through the trade routes of Persia and the Arab kingdoms. There is evidence that aristocratic Europeans were playing chess by the year 1000. Chess came to England after the Norman conquest of 1066. The game was popular all over Europe through the Middle Ages. The pieces from the Indian game were modified to fit the European world. **Horses** became **knights,** and the elephant became a bishop or a standard-bearer. The camel, called *rukh* in Arabic, became a tower but retained its name—*rook* in English. The vizier, the war commander, became a queen in European play.

Chess came from India during the early Middle Ages. Its pieces were adapted for a more European style of warfare without exotic elephants, camels, or viziers. Chess was treasured by knights, but anyone could play chess. A tavern had a simple set made of bone, while the bishop's palace had a fine set of silver or carved ivory. Either way, chess remained the dominant board game for centuries. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

Expensive royal chess sets could have pieces carved from jet or ivory or cast in **silver** or brass. Common chess sets used in taverns and homes had less expensive pieces. Some were made of bone; a slice of limb bone, with its marrow hollowed out, had a hole where a carved bone head could be inserted. The body could be carved and engraved with decorations to help distinguish it from the other pieces. Chess pieces could also be carved from wood or antlers.

The most popular games, after chess, were a set played on a board that connected spaces with diagonal lines. They are shown in many paintings, but the rules are unclear. The object of merrills, also called morris, was to line up pieces and capture others. Three men's morris was played on a board with nine holes or indentations. Players moved three pieces around, trying to block each other while lining up three in a row. Nine men's morris used a larger board with three squares, each inside the larger, connected with lines; players used nine pieces and tried to capture each other's pieces. Fox and geese formed a board shaped like a cross made out of smaller merrills boards. One player had a fox, and the other had a flock of geese. The geese tried to box in the fox, and the fox tried to capture geese by jumping over them.

Backgammon is one of a group of games played on a board marked with pointed spaces along two sides of board, leaving the middle open. The games were generally called tables and used markers and dice. Full game sets have been excavated at **castles** and towns, and, as even more evidence of the game's popularity, the board layout was found scratched onto the sides of

some coffins. Perhaps the game was played on the boards when they were just lumber, or perhaps gravediggers played the game while waiting.

Athletic Games and Contests

Another class of games used balls, just as in modern times. The balls varied in size, but only a few medieval balls have survived. They were made of a few pieces of leather stitched together, like modern baseballs. Four football-shaped wedges, or a long strip and two circles, could make a reasonable sphere. They were stuffed with moss, the springiest substance available before rubber was imported. Larger balls must have been made of similar construction and materials.

Villages often competed against each other in ball games similar to soccer. They may have used sticks, like field hockey, or they may have been kicking games. In late medieval English, such ball games are called camping, developed from an Anglo-Saxon word for fighting.

Boules was a game in which medium-sized wooden balls rolled across a lawn similar to croquet or bowling. Most often, there was a stake as a target, and competitors tried to hit the stake while knocking away others' balls. Quoits, a throwing game similar to horseshoes, was another popular village green game. As in boules, the quoit (a horseshoe or stone) was tossed to hit a target.

Tennis was introduced in the late Middle Ages. It was a development of shuttlecock, an older form of badminton. A shuttlecock has a weighted end and a feathered end for drag, and it flies through the air from net to net. Medieval tennis seems to have been played against a wall, like handball. As the newest game, it was a favorite of royalty into the Renaissance. Golf was developed as a sport in Scotland by the end of the Middle Ages. It was called goff. The earlier name for games like this was bittlestick, which meant a stick with a club on the end. Early golf courses must have taken advantage of the natural lay of the land and were probably very rough.

Wrestling was very popular among the common folk. Wrestling matches drew large crowds, and, at some **fairs** and festivals, wrestlers competed for serious prizes, like livestock. Wrestling required no special equipment or training and could be practiced easily among the peasantry. In one style of wrestling, the wrestlers wore scarves around their neck and shoulders and began the match by holding each other's scarf. Using this **cloth** for leverage, they tried to throw each other to the ground. Another style required the winner to throw the loser to the ground on a three-point landing. Wrestling could also be in pairs, with one on the other's shoulders. The top wrestlers tried to throw each other off their partners.

All competitive sports were played during the Middle Ages: races for running and jumping, shooting and fighting competitions, and competitions

for throwing objects, like shotput or javelin. There were games of marksmanship, particularly for archery but also for knife throwing. Archery practice was mandated in England in some eras so the citizenry could fight in militias if needed. Even without the mandate, many practiced archery for hunting or for competitive sport.

Apprentices liked to play at war games, imitating knights in war and **tournaments.** With wooden swords and shields, they organized large engagements on public land outside cities. Some of these battles were fought so fiercely that participants were badly injured or died, and city governments tried to stop them. While boys in training for knighthood played at tournaments as serious training using the official practice targets called quintains, common boys could devise games to imitate them. Riding wheeled wooden horses pulled by friends, on another boy's shoulders, or in **boats,** they aimed lances at targets.

The young knights and squires in the camp of a 15th-century tournament could spend their free time training and showing off with a quintain. The quintain shown here is an unusually elaborate one, since it is made in the shape of a knight. It was able to turn and swing its target out of the way as the rider struck it. Many were designed so that an improper blow brought the quintain's other arm swinging around with a rope, sand bag, or stick to hit the rider's head or back. (Steven Wynn/ iStockphoto)

As the **climate** cooled in the 14th century and more rivers froze, young people skated on the ice. Their skates were made from carved horse bones with holes drilled to help tie them on. Skaters pushed themselves along with iron-tipped sticks instead of lifting their feet as modern skaters do.

Children's Toys

The spinning top was a child's toy in the Middle Ages; it is attested in different places and times and may have been universal. Some had a groove in the side to pull a string and whip it into spinning, while others were spun with the fingers. There are engravings that show children playing games of bowling, croquet, and marbles. Early marbles were cherry stones and nuts; children also found or made balls of **brick,** stone, and clay.

Dolls were called poppets in most European languages. They were made of clay, wood, and cloth. Late medieval dolls were manufactured and sold, not only made at home, but early dolls must certainly have been home productions. Like today's dolls, some may have been babies and some grown women in clothes. Later dolls, manufactured for wealthy children, seem to have portrayed grown women in period clothing; there are a few images of them in paintings and engravings.

Archeological digs have turned up a few metal soldiers—knights on horseback—clearly molded by a smith. Some English princes had toy castles; young Richard II even had a pair of cannons. By the 15th century, the children of wealthy merchants probably also had pewter or **lead** soldiers.

Other simple toys and games available in all places and times were used by medieval children. They had rope swings on trees, and they built sand and mud castles and towns. Paintings show some children with toy horses—sticks with horses' heads and reins. There were some early kites, shaped like wind socks, in the late Middle Ages. Children also played games of hide and seek and tag. Hoodman blind tag involved turning a child's hood, the universal hat of the Middle Ages, around so that it covered his face.

See also: Babies, Holidays, Taverns and Inns, Tournaments.

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Garbage. *See* Latrines and Garbage

Gardens

Medieval gardens are a favorite theme in art. We see them in book illustrations, wall **paintings,** and **tapestries.** Tapestries, especially, showed flowers in such realistic depictions that naturalists can identify them as specific native and imported species. Gardens were encouraged and respected by the **church,** since they were images of both the original Garden of Eden and of heaven. Gardens symbolized man's success in taming nature and bringing back the original glory of Eden. **Monasteries** always had gardens, sometimes with pools and fountains like **castle** pleasure gardens. Monastic gardens were quiet, peaceful places of work and contemplation—images of heaven in a world full of noise and danger.

Gardens were both functional and formal. Practical vegetable gardens were everywhere, and they may not have been considered in the same way as the pleasure gardens of the wealthy. On the other hand, even pleasure gardens grew useful herbs or vegetables. Particularly in castles and in **cities,** gardens had to be carefully planned and cultivated to make the most of the limited outdoor space. Flower gardens became symbolic of the aristocratic ladies who owned or walked in them.

Kinds of Gardens

A garden could be called a *hortus,* a *herbarium,* a *gardinum,* a *vergier,* or an *herber*. The definition of a garden, as opposed to a farm field, was that the garden's soil was dug up by a spade, rather than a plow. Gardens and fields were taxed differently, so this was a legal distinction.

The yard around a peasant's hut, called a close, was usually a small farm, even in the cramped space of a village. It was enclosed with a hedge, if possible. It did not have a pleasure garden, but it provided some outdoor space

for children, and it was the wandering zone for chickens and pigs. A peasant's close grew beans or peas, and many tried to have a fruit or nut tree.

Aristocratic or monastic gardens were more specialized. The ideal gardens pictured in manuscript paintings are generally square and are laid out in an orderly way. They are enclosed with a hedge or a thick fence. Useful herbs are grown in one half, and aromatic herbs and flowers in another, with a section of lawn. The section with lawn has seats and shade trees and perhaps a vine arbor. By the 14th and 15th centuries, formal gardens at castles and manor houses were elaborate and luxurious. Many had reflecting pools or artificial fountains at the center, and paths led walkers around the flowers and trees. Seats or even tables stood near the pool or fountain so people could carry their **books** or needlework outside.

The first requirement of a real garden was its wall. The garden was an artificial place; it was not wild, and the more artificial it was, the more it was a garden, in medieval eyes. The best garden wall was made of **stone,** and, within a castle, stone walls were very likely. More common garden walls were made of poles lashed into a trellis of squares or diamonds, often with vines growing over them. Fences were also commonly made of wattle: vertical poles with pliant branches woven between them. Occasionally, a wall could be made of wide wooden paling, like a modern picket fence, but wood was expensive during the Middle Ages.

A wall might even enclose and tame a wild place; great palaces and manors had pleasure parks, which were tame **forests.** In these small parks that bordered the castle or manor, trees were planted in rows. No dangerous animals were permitted; harts, hares, and squirrels lived by artificial fishponds. The pleasure park was a safe place for ladies to walk and observe nature. Paths and bridges might even lead to a summer house. A royal park could house a menagerie in cages or within separate walls.

For pleasure parks, the natural fencing method of Northern Europe was the hedge. Young trees could be split and bent, and then thorns were permitted to grow thickly around them. Over a period of years, a living fence was created without much work expended. The farmer growing the hedge could entwine the branches together to make the hedge thicker. Some hedges were so thick that even small animals could not get through them. The next most common fencing method was a ditch, deep and wide enough to discourage animals from crossing it. The dirt piled up on one side, making the ditch even steeper.

Every practical or wild place could have its pleasure garden equivalent with the addition of a protective wall. Small vineyards could be turned into pleasure gardens with the grape vines trained over arched lattices to form cool walking tunnels. Herb and vegetable gardens, planted to maximize beauty rather than quantity of **food,** could also be pleasure grounds. Large gardens and parks could include a wildflower mead. Some paintings and

tapestries depict green lawns covered with many kinds of small flowers: daisies, violets, speedwell, periwinkle, and strawberry. Anything wild could be brought into a walled garden and made tame: ferns, cattails and bulrushes, irises, and columbine.

Formal gardens were laid out in careful, symmetrical geometry. Monastic buildings were laid out in enclosed patterns that provided space for small formal gardens of different sorts. The garth was a small lawn enclosed by a cloister; it often included some seats and maybe a tree, but it did not grow flowers or herbs. The monks kept its grass green and cut neatly. Another enclosure was the herb garden. Monasteries also grew quantities of simple vegetables, such as onions and cabbage, for their own use and for feeding the poor.

Within the larger wall of the monastery, but outside the cloisters, was a small orchard that often doubled as the cemetery. Cemeteries in monastery grounds also grew flowers or had fishponds. Monks were very conscious of the need for beauty to give rest to the soul, and they thought about the symbolism of the grounds. Monasteries also grew flowers and decorative plants for seasonal decoration needs. Ivy and holly were used at Christmas, branches were used as palms on Palm Sunday, white lilies and red roses stood for the purity and blood of martyrs on their **feast** days, and general flowers were used for festivals.

Monasteries had infirmary gardens, as did many castles and manors. Monasteries were **hospitals** and nursing homes for the incurably sick and aged. Additionally, in many monasteries, monks were bled at regular intervals in the interests of general health care. An infirmary garden grew mallow, an aid to blood coagulation. It also grew the opium poppy and some poisonous plants that could be used in medicinal blends: mandrake, hemlock, and henbane. Other medicinal herbs, including comfrey, feverfew, yarrow, plantain, pimpernel, and mouse-ear, were also grown. The infirmary garden, like the garth and the vegetable garden, was organized in careful squares and included benches for elderly and sick monks to rest in the sunshine.

Pleasure gardens at castles, palaces, and manors were carefully laid out for beauty, shade, and rest. The most common medieval name for these small, formal gardens was herber. They were like outdoor rooms. Areas of trimmed green grass were highly prized; thick green turf was considered very restful and beautiful.

One popular feature was to grow vines over an arbor that formed a tunnel or wall. Roses also grew in arbors. An arbor provided shade and broke up the garden into smaller spaces. Some of these spaces were devoted to particular types of flowers or herbs, while others were set aside for lawn games like bowling. A medieval herber used its small area to provide a maximum sense of privacy and space. Paths of gravel, sand, paving stone, or

An idealized medieval garden served as the setting for the allegorical poem "Le Roman de la Rose." In this illustration, all elements of a successful aristocratic pleasure garden are present. Walls subdivide the garden into more private quarters, linked by gates. A quiet green lawn and benches make the central fountain the perfect place for ladies and gentlemen to gather. The fountain's overflow becomes a stream flowing through the garden; this ideal stream even has a barred conduit that suggests a need to keep ladies' lapdogs from straying. Fruit trees and flowers make the pleasure garden into a useful garden, as well. In a real garden of this type, the castle cook would get the garden's apples and peaches for desserts. (The British Library/ StockphotoPro)

brick led from one area to another and created visual designs. Sometimes paths were edged with low walls or flowering plants.

All pleasure gardens had benches, called *banques* in French, and sometimes a banquet was served with trestle tables by the *banque*. The benches were not always simple benches; they could have two or three sides, shaped like an *L* or a *U,* and were called an exedra. This type of bench made it easier to set a trestle table in the midst of the company using it. Some benches were called banks and may have been artificially built banks, as along streams. By laying turf in layers, gardeners could create seats. Some seats built of stone appear to have grown grass and flowers on top.

Many gardens had reflecting ponds, and some had fountains. One reason for a garden to have a pond was if the builders who had constructed wattle and daub buildings at the site had excavated a clay pit. Clay construction formed many garden ponds, especially in England, where the heavy clay soil lent itself well to retaining water. Pools and fishponds were more common in Northern Europe, but fountains were built in the gardens of the aristocracy.

Fountains were most common in the hot climates of the Mediterranean, in Spain and Italy. There, many well-to-do families kept fountains in their courtyards and loggias. The early medieval palace gardens in Cordoba, Spain, were filled with pools and fountains, copying the garden styles of Persia. An ideal Persian-style fountain had a spout that bubbled or forced water into the air, a moving sheet of smooth water, and a still reflecting basin. Fountains cooled the air, and their noise masked the sound of conversation. Sculptors who designed fountains typically covered them with symbolism; the water came from women representing the Seven Graces or fell into a basin supported on the backs of royal lions, or the pedestal and basin were covered with **heraldic** or civic designs. A few Italian cities began to use fountains in public squares as a decorative means of providing public **water.**

Some fountains were located at natural springs and were just decorative spouts and tubs to collect the spring water. Others were powered by an unseen raised reservoir, and pipes conducted the pressurized water to the fountain. The higher the reservoir, the higher the water could spout into the air. Pumps had not been invented yet, so one problem with keeping a grand fountain was that the cistern had to be filled. Filling it manually, unless the water came from a tall aqueduct, was the only means. During the 15th century, Italian engineers designed treadmills to lift a series of buckets from a water source on the ground up as high as the fountain reservoirs. This machine was still muscle powered, so the fountain's operation depended on a staff of servants.

Vegetable gardens could be found at most **houses** that had any land because getting enough to eat was a constant occupation in the Middle Ages. Many vegetables do not require much space. In any **city** lot with some outdoor space, a garden was a high priority. While the poorest lived in flats without any other land but the street, the middle and upper classes of medieval cities gardened. Their city gardens were not usually as luxurious as castle and manor gardens, but they separated the small pleasure garden from the kitchen garden and grew flowers as well as cabbage. As the practice of gardening increased, some tradesmen began to cater to urban gardeners. They sold seeds and seedlings for common vegetables. Others sold grafted fruit trees.

Orchards on country manors were also enclosed, as possible. The easiest way to enclose an orchard was to dig a ditch; the ditch served to discourage

some animals from entering, but it was also a clear visual boundary. Orchards were protected property, and owners sued others for taking their fruit. Apples, pears, and cherries were the top three fruit trees. Chestnuts, walnuts, and almonds were the most popular nut trees. Many lesser fruit trees could be found in private orchards all over Europe: peach, quince, mulberry, plum, apricot, medlar, and fig.

Planting an orchard was a real investment in the future, and it required specialized gardening skills. Trees had to be planted 15–20 feet apart. Not only were they pruned, but also, in the spring, the soil was scraped back above the roots and fresh soil added. Orchard gardening was a specialized trade that included grafting, transplanting, and treating diseases.

Medieval Plants

We have detailed records, both written and pictorial, to tell us what sorts of plants medieval gardeners could grow. We know that plants later imported from the Americas were not yet grown in Europe, including tomatoes, potatoes, and maize. Similarly, although most medieval plants are still known and familiar today, some have lost popularity and are rarely grown. It isn't always possible to identify medieval herbs and flowers as modern variants since some gardening records use folk names whose meanings have been lost. Charlemagne's edict for what must be grown in gardens on his estates provides a good starting list; he mandated 80 plants, including roses and lilies, and including also many Mediterranean herbs he wanted to see established in France. Later gardeners wrote books discussing how to grow plants, how to use them, and even how to lay out a garden with them. The 15th-century French classic *Le Menagier de Paris* outlines the most useful plants for a city wife to grow for her home.

Practical vegetables were herbs for flavoring, leaf crops, root crops, and legumes. The most commonly grown plants were flavoring for other dishes: onions, leeks, shallots, hyssop, garlic, and parsley. Every country residence, no matter how poor, grew onions, garlic, or parsley. These herbs took up little space and were the first choice for urban gardens.

Medieval gardens commonly grew cabbage, lettuce, spinach, and colewort (similar to kale). Cabbage was a loose-leaf variety, not the tight round heads of modern supermarkets, and lettuce was dark, small, and often bitter, not sweet like modern iceberg lettuce. Root crops included roots still used today, such as radishes, turnips, and beets, but carrots were not orange. Carrots were purple or white, very similar to beets and parsnips. Legumes were lentils, broad beans (now known as fava beans), and peas. Peas included other types of beans, now called navy beans, kidney beans, and so on. They were dried for year-round storage.

Not all vegetables fell neatly into these main categories. In recipes and garden plans, we also read of cucumbers, celery, and melons. There were many edible weeds that could grow around the vegetables, and they were picked to go into stews and pottages: dandelion, borage, purslane, chickweed, and plantain. Mallow was considered a vegetable, and some edible flowers like columbine found their way into salads and stews.

Perennial herbs and flowers were a large part of kitchen and herb gardens. Mint is a perennial, as are savory, sage, fennel, and pennyroyal. Herbs grown for aroma and seasoning included basil, dill, marjoram, anise, and savory. Hyssop and tansy were bitter flavors used in pickles, meat pies, and omelets. Horseradish provided very strong flavor, and thyme, a cooking herb, was also a symbol of courage that could go into bouquets. Chives provided strong flavoring and also had pretty purple flowers. Violets, valued for their sweet smell, could go into salads and desserts. Primroses and pinks were also edible and used for flavor. Anise and caraway seeds were used as flavoring in simple candies with honey. Coriander seeds were another spice that could be homegrown and used to flavor wine and heal fever.

Medieval gardens did not distinguish clearly between decorative flowers and practical herbs. In fact, nearly all flowers had practical purposes. Iris roots made ink, and the iris flower's juice could either remove spots from cloth or create blue dyes. Crocus pollen was saffron, a bright yellow food coloring. Violets, roses, and gillyflowers (similar to carnations) were all used for flavoring. Marigold, named for the Virgin Mary, could be steeped in hot water for a drink, as could chamomile and horehound. Roses provided oil and rose sugar (roses boiled in **sugar** water), but their fruit, the rose hip, was considered an edible fruit. Rose oil helped headaches. Not only did decorative flowers have uses, but useful herbs often had beautiful flowers. Although an infirmary garden specialized in the most useful herbs, every garden had a display of colorful flowers at all seasons, and every garden contained useful herbs.

The queen of flowers was the rose, dedicated to the Virgin Mary. Red roses symbolized the blood of Jesus and of other martyrs, while white roses symbolized Mary's purity. Whole gardens of roses, dedicated to Mary, were called rosaries. Prayer beads could be made from compressed rose petals, and these beads were known as rosary beads. Although the direct link between roses and beads was lost after coral rosary beads became more common, they began as a simple product of the flower garden. Lilies honored Mary, too, and were always part of a monastic garden for decorating the church on **holidays.** The white Madonna Lily was believed to help with snake bite and leprosy.

Lavender, another near-universal flower, was used in scenting drying clothes, strewing on floors, and making medicinal oil. Chamomile was a groundcover plant that could be used for soothing teas or to scent clothes.

Periwinkle, another groundcover flower, helped with toothache. Wild strawberries made a juice to help with throat ulcers. Marjoram and elecampane, two other medicinal flowers, were used to promote sleep and heal wounds. Elecampane's roots could be boiled and mashed to make a sweet dessert, and they also made an effective medicine against whooping cough and asthma (it is still used in modern times). Feverfew was a perennial with small white flowers that could be used as a painkiller. Lily of the valley's delicate white bells, soaked in wine, made a remedy against stroke.

Foxglove's pink and white flowers on a tall stem were beautiful in a garden. It also made a cleansing emetic (later, its best use in regulating heart rate was discovered). Saint John's Wort, which bears pretty yellow flowers, could be used in a salve of oil, wine, and turpentine. It aided in the healing of serious wounds and infections. The flowers also were thought to drive away evil spirits, and they were more potent if picked on the eve of Saint John's Day in midsummer. Peony was another colorful flower whose seeds could flavor food or help a woman go into labor. Its root was believed to help with palsy and epilepsy. Celandine's mass of yellow flowers yields a medicine similar to opium, and the opium poppy itself was also grown in gardens. Betony produced a cluster of purple blossoms and was considered a good herb for nearly every complaint.

Some herbs were grown primarily for their use as **medicine** but did not produce showy flowers. Comfrey was used as a salve for wounds, and it has been shown to contain allantoin, which promotes the growth of new tissue below the skin. It was sometimes called boneset or knitbone. Fennel's leaves were chewed to help with digestive problems; agrimony made tea. Mint was not only a good seasoning, but it also helped heal dog bites. Yarrow helped stop bleeding, and rue was a disinfectant for cleaning. Pennyroyal tea helped with colds and nausea; sage improved the nerves. One of the greatest health problems in the Middle Ages was the parasite; people used wormwood and hops to kill intestinal worms. Wormwood must have been used cautiously, in small amounts, because it can produce hallucinations. Finally, aconite, known as monk's hood or wolfbane, was a poisonous herb used as a painkilling salve.

Black hellebore flowered in the winter, which was considered lucky; it was known also as the Christmas rose. Peasants thought it warded off evil spirits and often grew it outside cottages; it also was a purgative since it was mildly poisonous. Mistletoe, holly, and ivy had fall berries that remained on the plant through the winter. Their unusually hardy fruitfulness suggested a strong power of natural magic, and their splash of color made them traditional Christmas decorations. It was considered unlucky to cut them at other times.

Some flowers were from the woodlands and were grown in wildflower meadows. One of the most famous depictions of medieval wildflowers is

the last of the Unicorn Tapestries. The tapestry is called a millefleurs type because the background is densely covered with more than 100 kinds of wildflowers. These wildflowers were not rigidly divided from garden flowers, and they were included in some gardens. In the spring, primroses, daffodils, violets, and cowslips are among the first to bloom. The Jerusalem cowslip was also called lungwort and was dedicated to Mary, symbolizing her tears. Its broad spotted leaves looked like diseased lungs, so it was used as medicine for lung disease. Ordinary cowslip flowers could be used to make wine. Woodruff was a spring wildflower used for scenting mattresses and strewing on floors. In spring, people could gather flowers for posies to ward off the bad air of disease or for garlands for May Day. Wallflowers, violets, lilies of the valley, and rosemary were popular for posies, as were daisies, lavender, cow parsley, and rocket. Daisies were used for the easiest kind of flower garland, the daisy chain.

Gardening Methods

Medieval gardeners knew the value of manure and vegetable waste. Sheep, cattle, and **horses** provided valuable dung to enrich tired soil. Householders who owned doves used dove dung on their gardens. Those who could afford **latrines** with cesspits had them dug out every few years, and the manure was aged and used as fertilizer.

Gardens used raised beds when the soil was not deep enough or when it needed to be well drained. In these cases, the sides of the raised bed were outlined with stones or wattle and daub. Other gardens used beds that were flush with the surrounding grass and path. The size of a raised bed depended on the gardener's reaching distance; beds tended to be long and only a few feet wide. Paths between planting beds were sand, gravel, turf, or just trampled dirt. Gardeners may have kept furrows between plant beds for easy irrigation. If the garden site were by a small stream, miniature dams of earth, wood, or stone could let water into each furrow in turn.

Farmers used crop rotation, and gardeners knew that plants had to be moved into different beds while some beds were left fallow. Some plants, such as beets, required a full year to mature, while others, such as onions, were ready to harvest within a few months. One easy way to rotate crops in a garden was to leave the beet bed fallow for the summer while planting beets in the former onion bed, and then spading the prior season's fallow beet bed for onions.

Some plants could be transplanted into containers and moved indoors for the winter. Rosemary could be grown in a pot, as could bulb flowers such as lilies. Some other flowers, like violets and gillyflowers, could move indoors. Aristocrats may have kept small citrus shrubs in pots as novelties, even in the north.

A garden's green lawn and smooth hedges did not happen by accident. Large gardens required full-time gardeners, while smaller ones needed servants to include weeding, watering, and trimming in their roster of duties. (The British Library/ StockphotoPro)

Nuisance insects were just as problematic then. Some herbs, like wormwood and rosemary, were used as mothballs for stored clothes, and pennyroyal was thought to repel fleas. There also may have been herbs thought to keep insects out of gardens. To kill ants, sawdust was sprinkled on the anthills. Cinders and ashes killed caterpillars.

Gardeners used nursery methods of starting seedlings in a sheltered place, or rooting cuttings in water, and transplanting the young plants to larger beds. They staked plants that needed shelter and support. Pruning vines and grafting fruit trees were both skilled crafts. The most skilled gardeners created new plant hybrids; during the Middle Ages, some fruits changed appearance and size. Fruit trees and vines offered the greatest opportunities, but skilled gardeners also may have improved vegetables. Roses could be grafted.

Gardening **tools** were simple, but they did exist. Spades were wooden but had **iron** along the cutting edges. Mattocks and hoes chopped soil into smaller pieces or dug trenches. Sickles and scythes cut grass. Gardeners also used knives (particularly for grafting), axes and sharpened hooks for trimming branches and weed roots. The medieval watering can was a **pottery** jug with a set of holes in the bottom. Having filled the top, the gardener could walk along the planting beds and wave his jug to shower water on the plants. To stop watering, he could tip the jug up with his thumb covering the filling hole.

See also: Food, Medicine, Poison, Tapestry, Water.

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Gems. *See* Jewelry

Glass

Glassmaking technique has been known since ancient times. There are cuneiform tablets discussing how to make glass, and glass artifacts in Egypt date back to 1500 B.C. Glass is primarily made from melted sand, but the silica in sand melts at a high temperature, higher than ordinary fire can reach. The key secret of making glass is that soda lowers the melting point, allowing glass to form. Lime or **lead** must also be added to make the glass water-resistant. Early glass used naturally occurring natron, found in the deserts of Egypt, as the source of soda. Much later, glassmakers discovered that some ashes could also provide soda. Beech, a common tree in Western Europe, made good soda ashes. Because the twigs were turned to ash in an earthenware pot, it was called potash.

Glass blowing has also been known since ancient times. A chunk of molten glass is picked up at the end of a long metal pipe, and the craftsman blows air into it to make it into a bubble. By heating it, spinning it, and manipulating it with **tools,** he can shape it into a vessel. He can blow it inside a mold, removing the mold so that the finished vessel has the molded design on it. He can stretch or twist it and add pieces of hot glass, shaping

them into decorations or handles. The work must be done while the glass is hot, so the glass blower works quickly next to a kiln.

Glass Vessels

Glassmaking technique during the Roman Empire had been sophisticated, and, in the Mediterranean, the craft was uninterrupted by the fall of the empire. Vessels found from northern Italy, Syria, and Constantinople include both blown and cut-glass techniques, in a range of colors, both clear and opaque. Wine goblets, perfume vials with glass stoppers, and vases with handles continued to be made in Jerusalem, Cairo, and Constantinople. Corinth may have been another glassmaking center for turning out utilitarian cups, lamps, and bottles. Glass cubes of many colors, called tesserae, were used to make wall mosaics in Byzantine cities. Glassmakers also made brightly colored glass beads that found their way to outposts of civilization like England.

Glassmaking under the Merovingian Franks was simpler. Fewer colors appear; the glass was mostly green. They did not make a wide range of vessels but mostly turned out drinking glasses, known as beakers. One distinctive sort had pieces of hot glass added to the outside and then pulled into claw shapes. The claws were hollow and pointed downward, like bear claws or cow horns. The beakers were round on the bottom and stood on a flat foot. The Franks also made glasses that imitated their traditional drinking horns. The glass was blown into a cone and then twisted and curled to resemble a cow's horn. Frankish glass technique was able to apply thin trails of glass as decoration: wavy lines, lattices, or spirals. Anglo-Saxon glass technique was similar, perhaps imported from the Franks. By the 9th and 10th centuries, some glass bowls made in France and England used two colors streaked together. Usually red glass was blurred and streaked into blue or green glass. Cups and bowls were simple. The period of Viking attacks did not encourage technical innovation.

In Persia and Egypt, Islamic territories after the **Muslim** conquest in the seventh century, glass technique continued to progress. They blew intricate vase shapes and used molds, as they had in Roman times. They carved glass, creating a cameo effect when two colors were blown in layers. From **pottery** technique, they borrowed luster painting, in which **silver** and **gold** were enameled onto the surface by firing in a kiln. When Venice and Genoa began to dominate Mediterranean trade, they brought finely made Persian and Egyptian glass to Western Europe. In 1204, the Fourth **Crusade** sacked and looted Constantinople, and the Venetians brought back many fine pieces of glassware to their churches and palaces.

Following the sack of Constantinople, Venice controlled many former Byzantine regions and had firm control of trade in the Adriatic Sea. Inspired

by the fine pieces brought back as loot and taught by imported Byzantine glassmakers, Venetian glassmakers developed a large and sophisticated glass trade. The island of Murano became Venice's factory, supplied daily with boatloads of firewood from the mainland. Its isolation meant that its trade could be carefully controlled and also that the city itself was not at risk from the hot fires required for glass. They used local sand—crushed pebbles from the Ticino River—but imported barilla, a soda ash made from plants that grew in a salty area, from Syria. Barilla ash had lime in it, and it made superior glass. All Venetian glass had to be made from this recipe, and they were not permitted to export barilla to any other cities. They also imported broken glass shards, called cullet, for recycling.

Venice developed enamel techniques so they could paint bright, clear colors onto glass vessels. Enameled Venetian glass competed with the Syrian and Egyptian glass the Crusaders were now bringing home. The brightly painted beakers, signed by individual artists, were exported to all the aristocrats of Europe. By the end of the Middle Ages, Venice could make perfectly transparent glass from their highly protected formula by adding manganese dioxide. During the 15th century, they began adding crushed quartz pebbles to make opaque white glass. They developed bright colors and made opaque, colored glass religious medals with molds. Venice controlled its factory carefully, since a favorite trick of European rulers was to lure trained workers to their cities with promises of patronage and prestige. Because the glass was made on an island, Venice was better able to retain its craftsmen than most other cities.

In spite of Venice's efforts, the secret of making finer glass by adding lime to the mixture of sand and soda spread to the West. By the 14th century, prosperous regions like Bohemia, rich from its silver mines, were collecting and making clear, beautiful glassware. One type, the Keulengläser, was very tall and thin, perhaps 18 inches tall, and was decorated by small beads of glass applied in rows or spirals. The Gothic period in France encouraged its glass blowers to make tall, thin wine glasses that stood on narrow stems, like modern wine glasses.

However, perhaps as an effect of the mid-century plague, glass quality went down again in Northern Europe. In the 15th century, Germany's glassworks made thick, greenish glassware, nicknamed "forest glass." It was blown in a mold and decorated with trails of glass or with dots that were pulled into sharp points or small claws. The Middle Ages in Europe closed with no fine glass made outside of Venice.

Windows

Windows were the most practical use of glass. Glass solved the problem of letting in light while not letting out as much heat. In Constantinople,

The secret of firing enamel on glass was closely guarded in Constantinople until Crusaders helped Venice to sack the city. The island of Murano, in Venice's archipelago, became the next guardian of the secret. A hand-painted goblet like this was fantastically expensive, since no other glass workshop could come close to such fine work. (Museo Nazionale del Bargello, Florence, Italy/Giraudon/The Bridgeman Art Library)

glass windows were in the homes of the wealthy by the sixth and seventh centuries. Glass windows came to Western Europe more slowly, but, in 680, the abbot at the **monastery** of Monkswearmouth, England, hired Frankish glaziers to install glass windows (a glazier is a glassmaker who specializes in windows).

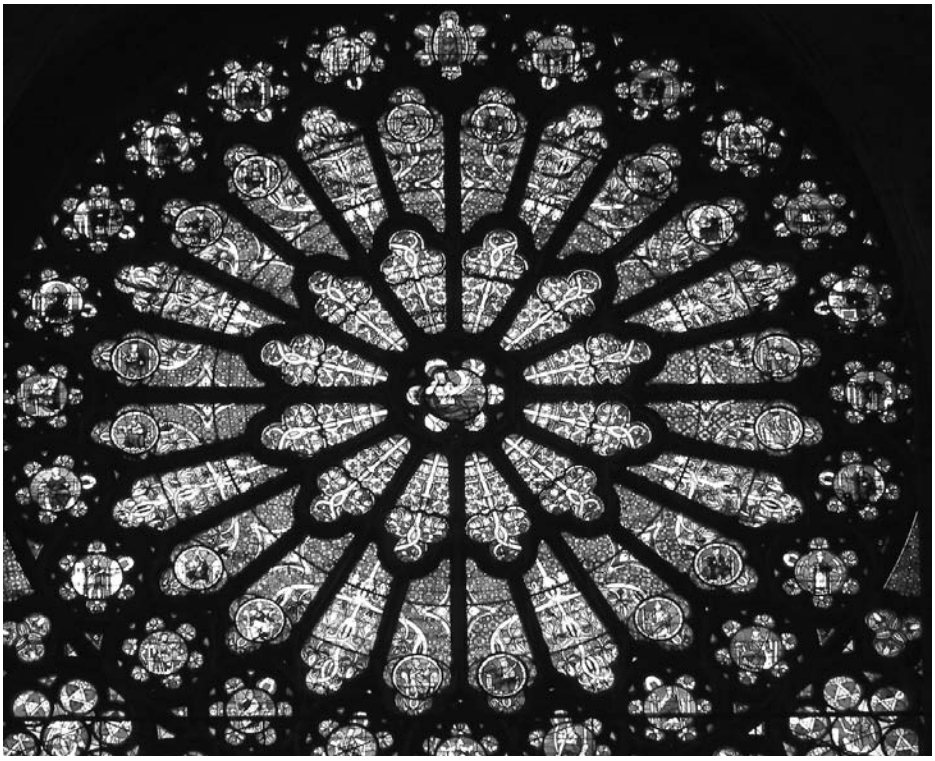
There were two methods of producing sheets of glass for windows. Both began with a lump of hot glass. A glass blower could produce a long cylinder of blown glass and then slit its side and lay it flat to cool. This was called muff glass. He could also transfer the hot glass from the blowpipe to a pontil iron, which was spun very fast until the lump of glass flared out into a flat circle. This is how the flat bottom of a bottle was made; it was called crown glass. The spun glass keeps a bull's-eye appearance, with rings in the glass as it gets thinner toward the edges. Early windows were made of many hand-sized pieces of glass that had been formed as muff glass or crown glass. The small pieces were held together by a lattice of lead, either in squares or diamonds.

By the 12th century, some **castles** had glass windows, but they remained a rarity in these residential forts. Fine houses in **cities** were more likely to use glass in the 14th and 15th centuries, and some manor homes or palaces had glass windows.

Since churches were built to be as beautiful as possible, not only glass, but colored glass, was quickly incorporated. The earliest known colored glass window in England dates from the 11th century, and it is mostly clear but has some colored pieces. By the 12th century, **cathedral** windows had full scenes. With the advent of the Gothic style, in 1144 at the new Cathedral Basilica of Saint Denis outside Paris, stained glass windows became the focus of a church. During the 13th century, architects and glaziers developed ways to make the windows larger and stronger.

Color was added to glass when it was first melted. The glassmaker added metallic oxides such as cobalt, copper, and manganese. Glass made with metallic oxides added to the clay pot mix was called pot-metal. The colors of stained glass were named for jewels, leading some to believe that jewels were crushed and added to the glass. Red was ruby, green was emerald, and blue was sapphire. Red would be too opaque for a window if it were used as a solid sheet of pot-metal glass, so it was usually made as flashed glass. Clear glass was blown, with a thin coating of red glass was blown on the outside. Both crown glass and muff glass techniques were used to make colored glass panes. Crown glass had circular ripples that could add good effect in a pane that represented the drapery of clothing.

Stained glass windows were planned, cut, and painted on large worktables that had the design drawn onto the top. As **paper** became widely available at the end of the period, the cartoon of a window design could be drawn onto paper, but, for most of the period, both **parchment** and paper



The rose window of a great cathedral was a focal point of its art. Since glass could be made only in small pieces, the window had to be made in sections with dividers. Elaborate rose-shaped windows with a thousand pieces of colored glass turned this limitation into fine art that still amazes modern viewers. (Lambert Parren/iStockphoto)

were too small and too expensive. It was much more efficient to draw directly onto the worktable.

Colored glass panels of approximately the right size were laid onto the design so the artisan could see the lines through the glass. Then the specific shape was cut with a hot iron that cracked the glass along the path the iron traced. The edges were smoothed and trimmed with another hot instrument, the grozing iron. In the 14th century, glaziers in Italy began to use diamonds to cut glass.

Stained glass panels were often painted. A dark iron-based tint made shadows or facial features stand out. Glass **painting** was its own craft, separate from glassmaking. The dark tint was applied with a paintbrush, and, when dry, it could be scratched away for light details. Applied more or less thickly, it showed on the glass as darker or lighter shades. Dark tint could give a face finer features than glass alone could give; most facial features and hair were painted. Other details, like shadows in the draping of a robe,

depended on painted shades. Last, painted glass panels had to be fired in a kiln to fix the metallic tint to the glass permanently.

If a panel was made of flashed glass, especially red layered over clear, an artisan could grind the red away to expose the white. This technique could make a saint's red robe have intricate designs, or it could make rays of light show against a red background. In some cases, the exposed white glass was painted. In the 14th century, painters used a tint of silver nitrate to tint glass yellow. Yellow paint could tint blue glass green, or it could make the clear spaces on flashed glass into gold.

Once all colored pieces were cut and painted, they were assembled on the worktable. Glaziers cast lead in long strips of an *H* shape, forming long notches on each side for the glass to fit in. The lead was bent to follow the shape of each glass piece and then soldered into place. The finished window was moved to the construction site to be fitted into the stone opening with more lead.

At first, structural **iron** bars divided the windows into panels because the leaded glass panes were not strong enough to stand against wind. Some windows used these divisions to create smaller scenes, while others allowed the bars to cross one large image. The window was typically about nine feet wide and three or four times as high. But later Gothic stained glass windows did not use iron bars to reinforce and instead used stone tracery. The tracery divided the windows into smaller windows that were easier to make, transport, and install. Glaziers only had to assemble portions of the window, and the masons would fix these round, flower-shaped, or arched sections into the stone tracery supports. The overall window size could be even larger, rather than held back by the limitations of the glazier's art.

See also: Cathedrals, Houses, Lead and Copper.

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Gloves. *See* Clothing Accessories

Gold and Silver

Europe produced very little gold until the late Middle Ages, but there had been numerous silver mines since early years. These two metals were among the most precious objects of medieval Europe (along with refined **sugar** and Chinese porcelain), and their value regulated the success and failure of national currencies and economies. The same craftsmen handled both metals and formed the powerful goldsmiths' guild.

Medieval gold was most often recycled gold from earlier pieces, hoarded and shaped for hundreds of years. The Byzantine Empire took in gold **coins** for its silk and other manufactured goods, and the emperors amassed extremely large fortunes in gold. In the ransack of Constantinople by the Fourth **Crusade,** Venetians and other Europeans took many precious items out of the city, including gold objects. The other key source of gold was Timbuktu on Africa's Gold Coast. **Muslim** traders brought gold from Africa, either by ship or across the desert to Egypt, and used it to mint coins. During the 14th and 15th centuries, gold was discovered in Germany, Bohemia, and Hungary. It was a source of growing prosperity for Hungary, in particular, which minted gold coins. Hungary may have supplied most of Europe's gold in the 15th century.

The island of Sardinia had been mining silver since Roman times, and, very early, silver was discovered in France. The Merovingian kings minted silver coins out of silver mined around Poitou. Under Charlemagne, the Germans began searching for silver deposits, and they found both **copper** ore and silver-bearing **lead** in the Harz Mountains. An accidental 12th-century discovery of silver ore in Freiberg, Saxony, created a silver rush of prospectors and miners. The Germans became experts in mining and metalworking and helped find and develop gold and silver mines in Hungary, Transylvania, and Serbia. Mines near Prague in the 13th century provided for Bohemia's modernization and development. Silver and lead were also mined in Devon, England, in the 13th and 14th centuries. The two elements were separated in refining, and the silver was poured into ingots.

Silver became the currency of choice for central Europe, since it could be found locally. Silver coins were the most common until the commercial wealth of seagoing Italian cities prompted them to strike gold coins

again. Goldsmiths had a central role in creating and reforming currency. A national currency needed to be roughly equivalent to other currencies, neither more nor less valuable. Goldsmiths understood how to regulate a coin's **weight** and value.

Goldsmiths' work rose to a high level of skill during the Middle Ages. Not only royalty and other aristocracy, but also eventually wealthy commoners, ordered gold and silver **jewelry,** spoons, knives, and belt fittings. Goldsmiths for royalty designed coins as well as crowns. They enameled decorative dishes, horns, and knives. They made gold wire and gold leaf, and they gilded articles made of other materials.

Royalty and the upper aristocracy used gold and silver dishes at **feasts.** Most prominent were the goblets and cups for their ale and wine. The cups at the high table had to be made of precious metal, and the best cup of all often had a lid. Additionally, they needed silver or golden wine pitchers and **salt** containers; salt containers for the high table became increasingly magnificent over the centuries until they were often large table decorations. For serving the high table, gold and silver platters and bowls, often with lids, were required. Spoons and knives at the high table were made of precious metal, as well.

Goldsmiths made other objects for the wealthy. **Hunting** horns needed silver and gold decorative bands, and belts and cloaks needed gold and silver clasps. Kings' **seals** were made of gold and silver, although, as the use of seals became widespread in the 14th century, common seals were made of lead, pewter, and brass. The finest, most expensive, and earliest seals were the work of goldsmiths. **Funeral** effigies also might use the work of goldsmiths, since a copper statue could be gilded to achieve a golden look at a smaller cost.

The mark of royalty was, ultimately, a crown. Goldsmiths were the only makers of crowns, which had to be gold. Kings and queens usually had more than one crown, and crowns were passed down as inheritances and given as bridal gifts. They were relatively simple during the 11th and 12th centuries, but later medieval crowns were elaborate and crusted with gems.

In the early Middle Ages, some monks were goldsmiths because the **church** wanted so many gold crosses, gold reliquaries, episcopal rings, gold and silver book covers, and so on. Saint Dunstan, an archbishop of Canterbury at the close of the 10th century, was known as a skilled metalworker, and he became the patron saint of English goldsmiths. Similarly, Saint Eligius was bishop of Tournai in the seventh century and, as a skilled engraver, became the patron saint of continental goldsmiths. Although by the close of the Middle Ages most gold work was done by secular goldsmiths in city guilds, there were always monks working in gold.

The church was a constant buyer of gold and silver. Every church and chapel needed a chalice, a fancy cup for the Eucharist wine at Mass. A chalice

often had a lid. Beyond the chalice, every cathedral and most churches needed crosses, bishops' croziers and rings, altarpieces, shrines, reliquaries, candlesticks, and **book** covers. Bishops' croziers were decorative shepherd's crooks to symbolize their role in watching over the sheep of God. They were highly decorated, both cast and gilt in gold or silver and set with jewels. Reliquaries were often the most decorative, expensive pieces in the church, since medieval people believed the saint cared how his or her **relics** were stored and would bring bad luck or allow the relics to be stolen if they were not kept with great enough honor.

Goldsmiths

Gold and silver were worked with similar techniques, chiefly by pouring molten metal into a mold and shaping the cool metal with a hammer and other tools. Silver was harder to work cold and had to be reheated (annealed) at times, but gold was very malleable. Both metals could be used as gilding on other materials, and both could be enameled. They could be riveted and soldered.

The goldsmiths of London were one of the largest, most powerful **guilds.** London had an unusually high number of goldsmiths for its population and relative wealth. In Florence, the goldsmiths were located on the Ponte Vecchio **Bridge,** at a place of maximum commercial traffic. During the 12th century, French goldsmiths began adding a mark to all their silver and gold pieces that showed the city of origin, and English goldsmiths followed. After a drop in gold craft following the **plague**'s chaos, the number of goldsmiths across Europe increased through the 15th century. Cologne had the most goldsmiths in Germany in the 15th century, but London may have had the highest number of smiths—over 400 by one report.

Goldsmiths were the only craftsmen with the knowledge to police other goldsmiths. Each goldsmith had a touchstone, a black rock that rubbed off a streak of gold if the gold was pure. Guild wardens made random checks at workshops with their touchstones. The guild also had the right to assay gold objects sold at **fairs** or made in the provinces. They checked to make sure no goldsmiths were counterfeiting gems. They enforced the use of regional and personal marks so that smiths signed their work, and, in the 15th century, they began marking each piece with a letter to stand for a year.

Goldsmiths worked with smaller-scale blacksmith's **tools:** a furnace with a bellows, crucibles, an anvil, hammers, and chisels. The goldsmith's furnace was smaller and could fit in the workshop like an ordinary oven with a chimney. Additionally, they used weights and a balance to measure their gold. Every shard of gold had to be collected neatly in the smith's leather apron. Worktables had a rim built up so that fragments and flakes of gold did not fall on the floor.

Gold and silver were cast in lost-wax and carved molds. The object had to be modeled and carved in wax, covered with fine clay and hardened, and then warmed so the wax ran out a hole that had been left with a finger of wax. **Stone** could also be carved into a mold, either open or in several pieces to be locked together for the precious metal to be poured in. Goldsmiths also made bronze dies to strike designs on items like spoon handles.

Gold and silver jewelry, reliquaries, and book covers often had enamel or niello decorations. Enamel was colored **glass** that had been melted onto the gold's while niello was a copper or silver sulfide. It had to be fired onto the surface, and it cooled to a flat black that contrasted with the gold or silver base. Niello was part of many late medieval **armor** showpieces. Enamel's effect was showier. One of the most famous medieval enameled works was a small horse placed at the base of a golden scene of a king worshiping the Virgin and Child, with his page and two saints. The horse stands at the bottom, waiting, held by a groom; although it was made of gold like all the other pieces, white glass enamel makes the horse look pure white, with a golden saddle and bridle—at the same time real and magical. Other elements were enameled, from the Virgin's robes to the king's hat, but the enameled horse stole the show; the piece is usually known as the "Little Golden Horse."

The work of goldsmiths depended on using a **poisonous** metal—mercury. Mercury occurs naturally in droplets in cinnabar deposits. Cinnabar had been mined in central Spain since Roman times, and mercury had been well-known since then. Mercury can dissolve gold, so it could be used to make a mercury-gold solution when gold occurred in impure form. Then the solution was raised to a high temperature to vaporize the mercury, leaving the now-pure gold behind. Mercury also acted as an amalgam to fix gold or silver onto the surface of another material. Gilding began with a solution of the precious metal and mercury. The solution was applied to an object, such as a button or a piece of armor, which was then heated to vaporize the mercury and leave the gold or silver attached.

Gold was often used in **painting** wooden panels or statues or books. Since gold has the unique property of not crushing into pieces easily, but tends to hold together in fine thread or sheets, it was hard to mix into paint. Flakes of gold were painted onto some surfaces, though, with fine brushes, especially if the desired effect was to have fine gold lines, rather than large areas. For larger areas, artists used gold leaf. Gold can be beaten thinner than paper, producing large quantities of gold leaf from a small amount of gold. The goldsmith started with a piece of gold, like a coin, and hammered it out thinner and thinner, finally placing it between sheets of parchment and beating it to the required thickness.

To apply gold leaf, the surface on the wood or parchment was covered with gesso, a type of plaster glue, and the gold leaf was pressed on. It had

to be burnished to shine, and often it was impressed with patterns. Sometimes, gold leaf then had paint applied, and the paint was scratched away in places to allow the gold to shine through. This may have been less fuss than flaking gold to make paint.

See also: Coins, Feasts, Guilds, Jewelry, Painting, Seals, Weights and Measures.

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Guilds

The Middle Ages were a time of rapid specialization of industries and crafts. The average European in 500 was a farmer, a hunter, or a warrior, but greater settlement required many different occupations. By 1500, there were hundreds of skilled and unskilled professions in city and countryside. General crafts, such as blacksmiths, splintered into many fine-tuned professions: locksmiths, pin makers, armorers, and buckle makers, to name just a few specialized smiths. New crafts came into being as new things were invented or as things previously custom-made for royalty became common items, such as **seals** or **books.**

The skilled professions in towns formed into guilds, associations of mutual help and professional standards. Guild membership was the certification of competency. Only male trades were organized in guilds; ale brewing was never organized, nor was spinning. Rural trades such as farming or sheepherding never organized into guilds, but miners and **masons,** traveling workers not tied to a town, were both free (of service to a lord) and soon organized. Town guilds controlled quality and oversaw apprenticeships.

The 15th-century guilds included outdoor skills—masonry, quarrying, mining, gardening, and brick making—and many more indoor skills. Some were involved in making **food:** cooks, bakers, saucers, butchers, spicers,

and ale brewing. Some made household objects: potters, soap makers, and chandlers. Some participated in different stages of **clothing** production: dyeing, weaving, fulling, tailoring, embroidering, haberdashery (selling clothing), tanning, glove making, hatting, shoemaking, and purse making. Some built: shipwrights, masons, joiners (carpenters), glaziers, and painters. Many made tools or even supplies for other crafts: ploughwrights, saddlers, buckle makers, nailers, wire makers, pin makers, needlers, tilers, armorers, fletchers, mold makers, and blacksmiths. There were fine crafts: goldsmithing, silversmithing, bookbinding, and clock making. And some sold things: merchants, fishmongers, and, in the late Middle Ages, grocers and drapers.

Guild Activities

Guilds were associations of men within a craft or trade for the purpose of helping each other. A guild set the standards for entering the profession and issued licenses so the reputation of the trade would remain good. Nobody was permitted to follow that trade in the town without the permission of the guild. The terms of apprenticeship were set by a guild, as were the tests to move from apprentice to master. Each aspiring master had to present a masterpiece to the leaders of the guild, fulfilling the requirements of a demanding test.

The guild's chief work was to organize and police its craft. They required that any craftsman who made a product must put a mark on it so it could be identified as his. Cut **stone, tiles, bricks, hats,** metal, **barrels, cloth,** and bread were among the products that must be marked. A guild could take action against any member whose work was not up to their standards. Guilds also helped members who were unable to complete work and gave weaker members instruction so the craft as a whole would remain in good repute. Members might make bulk purchases of raw materials like leather or **iron**.

Organizing a trade was easier than it would be today because trades were usually located in the same part of town or on the same street. Guild members might lease a workshop together. They knew each other well and were neighbors for life. They gave each other social assistance, from help when a member was sick and unable to work to support in his old age or burial and **funeral** Masses when he died. Some guilds, such as the masons, used their dues to set aside a pension for old or injured members.

In many trades, the guild sent out officers to do random quality checks in the **city;** the bakers of Paris could count on their bread being thrown away if the guild decided it was impure. They regulated terms of work: hours, days, **holidays,** and whether work could be done at night. They regulated size, style, prices, and wages. There were few aspects of the work guilds

The daily life skills of a guild's profession received a royal treatment in official guild ceremonies. Full guild members wore special robes showing their membership, and their elected leaders were like kings within their small common spheres. Here, the consul of a masons' guild watches while two workmen demonstrate their abilities to carve stone and wood. Guild approval was hard to get and critically important. The guild took responsibility for its members' quality, for arbitration in disputes, and even for old-age care and funerals. (George Unwin, *Gilds and Companies of London*, 1908)

did not regulate. The guilds of merchants and craftsmen sometimes found themselves in opposition as merchants sought low prices and craftsmen sought a living wage. They acted like unions, making demands for collective bargaining.

Like modern unions and companies, small guilds combined into larger guilds for better leverage. Some craft guilds became associated with merchant guilds for better deals. By the 15th century, London had only 12 main guilds, down from 50. These 12 large guilds were each granted the right to have a coat of arms, as though they were knights. They were the mercers, grocers, drapers, fishmongers, goldsmiths, skinners, haberdashers, merchant tailors, salters, ironmongers, vintners, and cloth makers.

Guilds had trade secrets that had to be passed on to apprentices and masters within the trade. They guarded their trade secrets carefully, and being admitted to the guild meant taking on this responsibility. Painters and glaziers had recipes for paints, dyes, and colored **glass;** joiners had recipes for glue. Metalworkers had secrets for making metal alloys. Salters knew where the best sources were, and fishermen had secret **fishing** banks.

Guilds in other regions often tried to steal each other's secrets, which led most regional guilds to bar foreign workers (who might be there to learn the secrets and then return home) and to banish their own workers who had made lengthy stays abroad (and could have taught the secrets). National laws often restricted craftsman travel for the same reason. A few weavers

imported from Flanders had spread the fine points of weaving to a new, competing industry in England. The secret import of a few silkworms from China had destroyed China's exclusive export of silk. Most regions had a trade specialty, and it was clear that if it spread, they would lose their market value.

Guilds were self-governing. They constituted some of the earliest practice in limited democracy in an age of aristocracy and monarchy. In the 12th century, King Henry II gave a charter of self-governance to the merchants' guild and the weavers' guild. Other guilds followed soon after. They had their own courts to settle disputes and wardens who exercised regulatory oversight. Although the guilds met in separate halls to govern themselves, the mayor was elected by all of them. Each guild sent an alderman to elect the chief alderman—the mayor. In 1354, the king of England granted the mayor of London to be called "lord mayor." The concepts of city government and citizenship came from the ways the guilds interacted and controlled commerce.

The guilds also worked together socially. Many developed a uniform gown, called a livery, so they would all match and look impressive when they rode in a procession. The livery was created by the guild and distributed to members, so the word *livery* is related to the word *delivery*. In some places and times, all guilds in a city used the same livery each year, usually a parti-colored surcote. In some guilds, livery was reserved only for the top-ranking guild members.

Guilds built halls to meet in, some of which included a kitchen and guest rooms, probably for traveling guild members. Some halls included a **garden** that members could enjoy. The wealthiest guilds supported charitable projects like **hospitals,** as well. Poorer guilds met in a local church and adopted the church's patron **saint** as their own.

The goldsmiths' guild in London was one of the richest guilds. Its hall was the first built in the city, in 1366, and it remained the grandest. It was designed like a medieval **house,** with a prominent, large meeting hall. In the 15th century, the guild commissioned **tapestries** telling the story of their patron saint, Saint Dunstan, to hang in the hall. They also had a silver statue of Saint Dunstan and fine cushioned chairs for the guild's officers, as well as ordinary tables and benches. Attached to the hall were the rooms for food preparation: pantry, buttery, and kitchen. There were chambers above and a separate parlor for the guild's officers to meet in. In the 15th century, the guild bought some musical instruments and kept them in a locked chest so they could hire **minstrels** to play them at **feasts.**

Guilds put on festivals in honor of their patron saints and other church holidays, and, by the middle of the 13th century, guilds had taken over theatrical productions. The **church** had been producing plays that acted out stories from the Bible or from the lives of saints, but guilds began to put

these on for the public, perhaps once a year. They built stages in marketplaces and used scenery and props. Building on this tradition, they began to put on secular shows for big occasions, such as the coronation of a king or the election of a mayor. They lined their streets with banners and arches and posed actors dressed as mythological figures on them, or they built the decorative **wagons** that led to modern parade floats.

Apprentices

Apprenticeships were individual contracts made between a boy's family and a craftsman whose trade they wished him to learn. While many apprentices were schooled in the same craft their fathers practiced, since that is where the family had connections, the apprentice system permitted boys to step into another trade. The system developed throughout the Middle Ages and came into full development only after 1200. Before this, boys followed their father's trade; before the growth of towns during the 13th century, most men were rural serfs. The apprenticing system was a large step forward in education and freedom.

In this detail of a stained glass window, a shoemaker's young apprentice stands at the counter of his master's shop. He holds a leather-cutting knife and gestures toward a display of boots. Medieval shoes and boots were made with the same techniques. They were usually made to order for a particular customer, but with a rough sizing convention in place, shoemakers could also make basic shoes to display at fairs. As with all crafts done outside the home, the cordwainers' guild determined all standards. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

Guilds set the rules for apprenticeships, and they varied by craft, time, and place. As a general rule, boys younger than 7 could not be apprenticed, and most began closer to 12. The period of apprenticeship was usually around seven years, and rarely less. Crafts with the finest skills, such as clock makers or goldsmiths, required the longest terms, while cooks and bakers required terms of only a few years. A boy's family could pay a higher apprenticeship fee to buy a shorter term, in some cases. A master was required to give his apprentice living space and food, and sometimes he gave him a small amount of money. If a master did not treat his apprentice well, the guild would investigate the complaint and find the apprentice a new master if the original one could not remediate his ways.

The apprentice did menial chores and began to learn the craft, and the master could not expect to earn any profits from his work for the early years. The guild's wardens inspected wares and did not permit sale of beginners' work. As the apprentice learned, the master might begin to profit, and he was permitted to keep this profit in order to earn back the losses from his earlier teaching. The apprentice could be hired out with a builder's crew at a fraction of the cost of a skilled worker, or his wares could be sold in a shop.

The transition from apprentice to master usually took the form of an examination by the guild. The guild specified a masterpiece that served as a test of skill. A baker's masterpiece would be a set number of difficult breads and pastries, completed within a set time. A mason's masterpiece would demonstrate mastery of arches, pillars, walls, and foundations. A goldsmith's masterpiece would be intricate jewelry. These tests varied widely over Europe, and they tended to be more challenging in places where the guild did not wish to admit many new members. Some guilds also required a year of traveling, working for wages, to learn the craft as practiced by other masters.

See also: Barrels and Buckets, Cities, Drama, Gold and Silver.

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Gunpowder

Gunpowder was formulated in China during the Middle Ages; its written formula was published in the 11th century, and, in the 13th century, fire arrows and simple guns were produced. Chinese emperors tried to make saltpeter and the gunpowder formula a secret, but somehow it was transferred to Europe, across the Arab empire. Its use in Europe revolutionized warfare. Gunpowder required training, but not the noble training of a **knight.** Gunpowder specialists were technicians whose hands got dirty, and they were usually lowborn trained technicians. The medieval association of warfare with **castles,** nobility, and good manners was of no use in an age of cannons. The introduction of gunpowder was the beginning of the end of the Middle Ages.

The original formula for gunpowder used charcoal, sulfur, and saltpeter, along with some inactive ingredients such as arsenic. Saltpeter is potassium nitrate; it was called in Latin *sal petrae,* or "stone salt." It was a known substance in medieval Europe and was used as both preservative and **medicine.** Small amounts of it grew naturally on **stone** walls in certain environments, particularly stables and **latrines.** Northern Europe's **climate** did not produce large enough amounts of it to support an industry, but large saltpeter deposits occurred naturally in Spain and India. It was imported to Europe through Arab and Venetian traders. Most saltpeter in the Middle Ages was imported this way until, in the late 14th century, Germans worked out a way to grow it on purpose using earth, dung, urine, and lime. By the 16th century, there were saltpeter farms.

Sulfur occurred naturally and could be found in Europe. Charcoal was a very common ingredient, but gunpowder required a fine-structured charcoal with minimal ash. Willow wood made the best charcoal, and a few other kinds of wood, all small, could be used: grapevines, alder, hazelwood, and chinaberry. The charcoal had to be ground finely with a mortar and pestle and then mixed with finely ground sulfur and saltpeter. Grinding gunpowder was dangerous; it could explode in the mortar, maiming or killing the artisans.

Gunpowder made of charcoal, sulfur, and saltpeter was described by Roger Bacon around 1260 in a scientific work he wrote for the Pope. He spoke of it as an astonishing explosion that could terrify men but did not discuss its use as a **weapon.** In the 13th century, it was seen only as a method for making fireworks and rockets or for setting houses on fire in a **siege.** True gunpowder as a propellant came in the 14th century.

The first cannons were simple, small devices for shooting bolts at high velocity. They were large **iron** bottles, and the explosion of the gunpowder inside shot out a bolt with iron fletching. The French called them *pots de fer,* or "fire pots." The city of Florence cast small cannons and bought a supply of powder for possible defense of the city in 1326, and French forces may have used *pots de fer* in a siege in 1327. **Muslim** armies in Spain, fighting against the advancing Christian armies, may have used cannon around the same time.

The first documented use of gunpowder on a battlefield was by the English at the Battle of Crécy in 1346. They had three cannons next to their longbow archers. The type of cannon could have been a ribald. It was a set of tubes, loaded with small balls, locked together on a wooden frame. The touchholes of these tiny cannons were in a line so the gunner could set them all off at once, in a single sweep.

Names for early gunpowder weapons included not only fire pots and ribalds, but also various terms referring to their thunderous sound. The term for a gun in English became *blunderbuss,* while in Italian it was *schioppi,* a thunderer. The word *cannon* came from the Latin *canna,* a reed, since it was made with a tube. *Gun* was another early word; it was used by Chaucer in 1384. He spelled it *gonne* and called its bullet a pelet.

The earliest gunpowder-fueled weapons were very crude by later standards. In this early 14th-century picture, a team of men is managing a "pot de fer," whose ballistic load seems to be pointed like an arrow. Gunpowder technology was far from standardized in those times. Every weapon was uniquely designed and had a different concept. Gradually, experimenters found that the best use for gunpowder's force was not in darts but in large rocks used to batter walls, and the standard cannon was born. (The British Library/StockphotoPro)

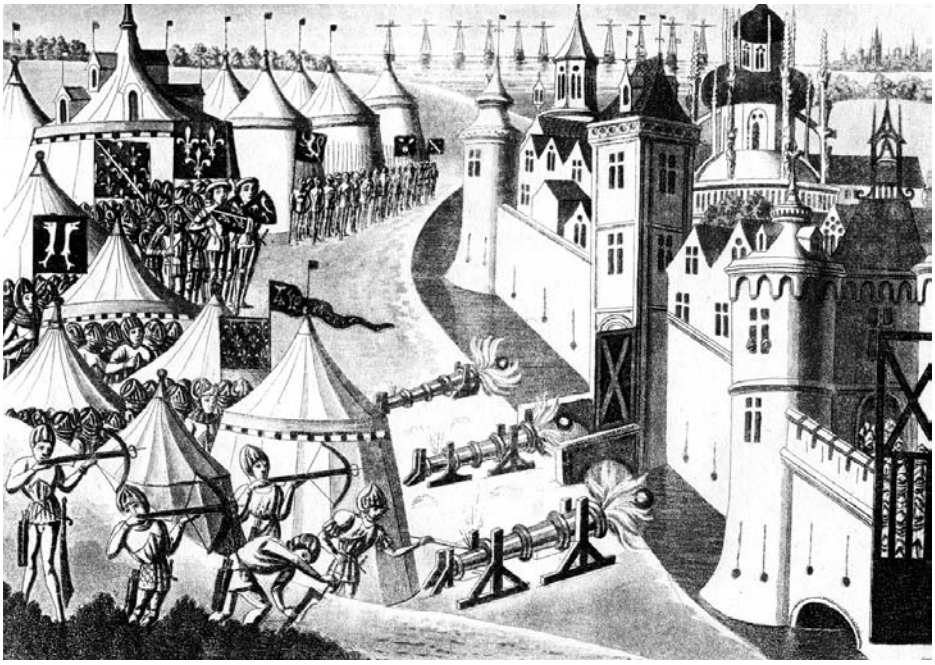
The main problem in war in the 14th century was how to break a siege by effectively battering a castle or **city** wall. Early cannons were made of cast bronze, but they were too small and weak to damage stone walls. Later, larger cannons were made by welding iron bars and rings in a process similar to making **barrels.** Hooped cannons could be made very large and had to be moved on special carts that were lifted by pulleys and towed by many yoke of oxen or pairs of **horses.** The first cannonballs were often stones rounded to rough spheres by masons. Early matches were pieces of rope soaked in saltpeter and sulfur so they would smolder slowly.

These early cannons, called bombards, were usually loaded at the back. There was a separate metal chamber with one opening and a small hole for ignition. The gunpowder was packed into this, and a wooden plug covered the opening. When the chamber was placed against the end of the cannon itself, the wooden plug touched the cannonball. When the gunpowder was ignited, the wooden plug and the cannonball would both blast out the mouth of the cannon. There were accidents; sometimes the metal chamber could not hold the blast, and it flew apart, killing bystanders.

Since cannons were used as siege engines, they were designed to be larger and larger. Longer cannon barrels meant greater velocity and accuracy. The stones for these large cannons could weigh 200 pounds or more. By 1388, one large bombard required 12 horses to draw its cart. Nuremberg's hooped cannon, called Krimhilde, shot 300-pound rocks. Bombards in the 15th century were even larger. The duke of Burgundy had one made that used 100 pounds of gunpowder to shoot a 500-pound stone.

Sieges were now broken quite literally by repeated thunderous booms and huge stones or iron balls crashing into the fortress's stone walls. Battering rams and siege mining, the old methods, could take six months to bring down a wall. By 1450, that same wall could be pounded into rubble in about two weeks. The cannon's success in breaking sieges meant that battlefield victories became more important. City and fortress walls were meaningless; a king could only protect his land by winning battles. Joan of Arc, in her campaign against the English in 1429, used cannons on the battlefield.

Gunpowder technology was the deciding factor in the 1453 fall of Constantinople to the Turks. A metalworker named Urban, reportedly from Hungary, offered the emperor in Constantinople his services to make cannon. When they did not offer to pay him much or give him good metal resources, Urban crossed over to the Turks. For the Turks, he made a large cast-bronze bombard with a long barrel and a removable powder chamber. The Turks used it to menace and stop shipping in the Bosporus Strait. Urban made a second bombard, even larger, with a 26-foot barrel. The Turkish army used this and many smaller piece of artillery to batter the walls of Constantinople until they had breached the walls and could open the main gate.



Early cannons had only one purpose: to batter stone walls more effectively than battering rams. Rams had to be swung by rope, close to the wall, and that left the ram's human team exposed to attack. Cannons could throw stones and iron balls at the walls from a little distance away. By the close of the 14th century, the use of cannon, as at the siege of Tunis, was routine. When the cannon's force overcame even Constantinople in 1453, it was evident to all city planners that walls were no longer a good defense. Battles had to be won in the field. (Duncan Walker/ StockphotoPro)

Gunpowder manufacture became more skilled and on a larger scale as the cannon proved successful in breaking sieges. Gunpowder was corned during the 15th century; it was wetted with wine, rolled into balls, and dried. Guns became increasingly larger. French cannons began using iron balls, instead of stone. In the last years considered medieval, handguns were used in Italy. They were very simple front-loading guns with iron tubes mounted on wooden stocks.

See also: Sieges, Weapons.

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A

Hair

Roman hairstyles for men had been short and clean shaven, while Roman women wore elaborate braided and jeweled hairstyles. Barbarian men at the same time often had long hair and beards, while barbarian women used a variety of braided and veiled styles. When the Roman Empire ended, the Eastern Roman Empire of Constantinople became the fashion leader. In the late Middle Ages, women's hairstyles were sophisticated and difficult to create. Their hair was integrated with headdresses, **hats,** and veils. Men's styles alternated between long and short but were always simpler than women's.

European hair care was simple through most of the Middle Ages. Not more than once a week, and usually less, hair was washed with soap and combed out. Combs are routinely found in Dark Ages burials. They were made from thin slices of bone or antler that could be cut into thin teeth, and a second piece was riveted to the handle to strengthen it. In a big **city** like Constantinople, combs were carved from ivory or cast in **silver.** A variety of ties, **jewels,** and pins were used to hold hair in place.

Women's Styles

Early medieval styles, in Constantinople and Northern Europe, seem to have been most commonly a pair of very long braids. Byzantine **women** did not cut their hair unless they entered a convent. At the end of each braid, they wore a weighted pendant that covered the hair's ends. This pendant was their opportunity for jeweled decoration.

Northern European women—Franks and Anglo-Saxons—usually wore veils and scarves. We have few pictures of women in this time, and all images show their hair covered. We do not know how they wore the hair itself. Anglo-Saxon women probably braided it, but they may have left it loose. Norman ladies seem to have worn long single or paired braids.

During the 12th century, Norman ladies in England began wearing their own hair, without a veil. It was divided into braids, either two full braids or two braids at the front with the back hair loose. These braids were often wrapped in long ribbons.

Young girls during the Middle Ages are nearly always shown with their hair long (below the shoulders) and loose. It was sometimes bound with a fillet or barbette as the fashion of the times dictated, but it was not braided or coiled. The fillet was a cloth or metal band that encircled a woman's head, while a barbette was a vertical cloth band that ran under the chin. The common girl's form of fillet was a simple ribbon of **cloth** around her head. For spring or summer **holidays,** a girl could wear a flower garland.

There are few pictures of early medieval women's hair; most show hair in very long braids. Often, these braids were wrapped in ribbons or cloth strips. In this 12th-century book illustration, an English Norman woman has hair so long that it might never have been cut. Her two braids are closely wrapped in linen strips so that the hair cannot be seen. (James Robinson Planche, *An Illustrated Dictionary of Historic Costume*, 2003)

During the 13th century, noble women parted their hair along the center and made two braids at the side. These braids were curled around in the shape of ram's horns and pinned with decorative hairpins made of bone or brass wire. Sometimes the braids were shaped to stand out from the head with the tip of the braid sticking out like the point of a ram's horn. The braids might be wrapped in linen as they curled, or they might be confined in a crespinette (hair net) after they were pinned.

In the 14th century, the two-braid style moved from spirals to thick columns next to the face. The columns could be achieved by wrapping the braids around the rim of the face so they looked like vertical pillars from the front. The braids could also be layered vertically, up and down just in front of the ears, to be like pillars. They were pinned, encased in a crespinette, or even slipped into a fillet or crown that helped hold these pillars in place.

The style became more elaborate as the 14th century passed. Women who did not have enough hair to wear these styles wore hairpieces and extensions. One hairpiece, excavated in London and dating to the 14th century, consisted of a decorative tablet-woven fillet band around the head with braids of hair attached by decorative mounts. The braids were in the

vertical-pillar style and hung to about the bottom of the ears. Combinations of headdresses and false hair must have frequently contributed to the increasingly artificial look. Mid-century, one style fitted the fillet with open caul cylinders of wire mesh. Either false hair or the lady's front hair was drawn into these cylinders, which formed literal pillars next to the face.

There is also some pictorial evidence that wealthy women wore false hair made of silk. Paintings often show Italian women with blonde hair, which was very unusual in that region, and some city ordinances passed sumptuary laws forbidding servants to wear silk false hair. Their hair could also have been bleached with lemon juice and sunlight, as Renaissance women in Italy later practiced.

The 15th century was a time of rapidly changing fashions for women's heads. Most illustrations show women with elaborate hairstyles that must have been heavy, hot, and cumbersome. Conversely, some illustrations from France and Flanders show young women with short, curly hair, held by a simple cap or fillet. Italian women's styles sometimes depict long ponytails, tied with silk ribbons. In other pictures, they wear a coil of real or false hair on top like a hat, while the rest of their hair is free. There are even illustrations of court ladies in all regions with loose, long hair only bound by a fillet.

Court styles in the North during the 15th century used hair to complement increasingly exotic headdresses. Hair was still braided, and the braids were pinned close to the head so that only the headdress showed, or they were curled, layered, and pinned in shapes to fill or support the headdress. Some headdresses were shaped like wings, or hearts, and required the hair to be pinned up in these shapes. The cone-shaped hennin, on the other hand, required the hair to be pulled back out of sight, knotted into a bun, and hidden under the cone.

The 15th-century fashion was to have a high forehead, and some women plucked their hairlines to make their faces longer. Some illustrations show such extremes of plucking that the women appear to be bald, capped only by an expensive headdress. They also plucked their eyebrows to be very thin, almost invisible. This fashion may have come from Italy, where early 15th-century illustrations show women with hair very tightly pulled back. In this hot climate, the heavy headdresses worn in Germany, northern France, and England were not appealing. The common factor between Italian images and English ones are the artificially high foreheads. In extreme cases, some Italian women are shown bald nearly to the crown of the head. Their hair, behind this plucked region, was swept into tight braids or coils or held tightly by a fillet or a silk cap.

Men's Styles

During the Roman Empire, men had routinely shaved their faces and cut their hair. Until around the year 800, shaving and maintaining short hair

continued to be the fashion in Constantinople. After that time, the fashion shifted to long hair and beards.

Monks always shaved their heads. It was an international style that began with the monks of the fourth century, imitating Egyptian practice, and it has persisted into modern times. Most European monks shaved the top of the head, leaving a circle of hair around the forehead and ears. Some Celtic monks shaved the front of the head, leaving it long in back. In the late Middle Ages, the one exception to the monastic shaving rule was the **monastery** on Mount Athos, in Greece, where women were strictly forbidden and men were ordered to grow beards so women could be quickly spotted. All other monks were clean shaven with shaved heads.

The typical medieval man's hair length was between shoulder and ear, cut to one length, and brushed to curl under. Among the working classes, hairstyles varied little; hair was kept short enough to be practical but long enough not to need much cutting. Beards came and went in style. Shaving was a mark of having time and money, since poor men did not have the means to shave or visit a barber and had to be out for work at dawn. As a general rule, young men were clean shaven, although they may have visited a town barber only once a week. Often, as they grew older, they grew beards as a mark of gravity and importance.

The Bayeux Tapestry shows Normans with some distinctive hairstyles. Some fighters have their necks shaved partway up the back of the head, and the remaining short hair is brushed forward toward the face. The Normans at that time often wore mustaches; they called them guernons. Anglo-Saxon men in the Bayeux Tapestry are shown with short hair and mustaches but without beards.

Long hair was fashionable in France in the 12th century; some men braided strands at the front, which were tied behind to keep the hair in order. In some periods and places, such as the early 13th century in England, young aristocratic men parted their hair from ear to ear. The back hair was combed back, while the front hair formed a short curled fringe. Such an impractical hairstyle was a mark of wealth. A more practical, universal haircut for the 13th century was at the shoulders or just above, with a short fringe of bangs across the forehead. In pictures, **knights** with this haircut usually have curls, and some could have used a curling iron to curl the ends.

The late 14th century, when clothing for men became more foppish, also brought back facial hair. Beards and mustaches became fashionable at the court of England's Richard II. They were carefully trimmed, sometimes pointed. Hair grew longer, to the shoulders.

The most extreme change in length was a period in the 15th century when cropped hair was stylish. It looks like what we call a bowl cut—all one

Elizabeth Woodville, Queen of England at the close of the medieval period, was considered one of the most beautiful women of her time. She followed the hair fashion of the 15th century by plucking hair to make her forehead seem larger. Her hair was always shown pulled back very tightly, in contrast to earlier styles that looped and draped hair around the face. A rich hat that almost entirely covered her hair completed the fashionable look. (iStockphoto)

length, but short and forming a circle around the head. It was brushed to stand out from the head, but with the ends curled under. Around the same period, some men shaved the backs of their necks well into the hairline so no hair showed below their hats. Some images of men in tall 15th-century hats make them appear bald.

On the other extreme, the 15th century in Italy saw a fashion for curly, bushy hair for young men. It was not very long, but it may have been braided at night to turn it curly. Florentine dandies also may have bleached their hair as the women did. Blond hair was very fashionable and is shown in some illustrations.

See also: Cosmetics, Hats, Hygiene, Jewelry.

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Hats

Medieval styles for hats, headdresses, and **hair** tended to be universal across Europe. However, styles that began in Italy or France took time to reach other countries. Travelers brought the styles, and royal **marriages** generally brought a different wave of fashion with the new queen and her retinue. In cold countries like Germany, heavy headdresses that covered the hair well were more popular. In warm climates, such as in Provence and Italy, uncovered hair and light veils were the norm. At a time when **women** in the North were veiled and wimpled, a young Italian woman appears in an illustration with braids pinned around her head in a simple, timeless style. Northern France and England, due to a high rate of intermarriage and travel, were similar, but England's styles lagged behind France's by 5 to 10 years.

During the Middle Ages, the rate of fashion change sped up, until, in the 15th century, aristocratic women had to alter their head style every three or four years, if not more often. Men's hats of the 14th and 15th centuries were as attention grabbing and nearly as elaborate as women's. Commoners' styles did not change rapidly.

In the early Middle Ages, Constantinople and the surrounding **cities** of the Byzantine Empire were the originators of all ideas of fashion. Some cities in Italy were under Byzantine rule until the late Middle Ages. Other cities in Italy copied the sophisticated Byzantine fashions, and travelers reported them in Northern Europe, where they were eventually imitated.

Byzantine empresses wore a hat based on the turbans of the East. The cap was close fitting, and around the brim of the head it was a large roll of silk padded like an inner tube. It was covered with pearls and gold, and their hair was hidden under it. Byzantine women other than the empress began to wear linen caps of the same design—close fitting and covering only the top of the head, with the brim rolled. It was a true hat, not a veil or hood. In time, hats like these were introduced into Europe, and they replaced traditional veils.

Women's Styles

In the early Middle Ages, as a rule, all Northern European women wore some kind of covering on their heads. When there was no other style of hat available, women wore veils and scarves. These veils could be large or small, rectangular or circular. They were usually made of light fabric. Wealthy women wore them with graceful folds and sometimes with **jeweled** pins to hold them in place. Although modern use of veils suggests covering the face, these veils only covered the head.

The Anglo-Saxon head-rail was a lightweight piece of white linen with a circular opening for the head. It was set on the head, hanging over the

forehead, and was pinned in place with decorative straight pins. It covered the lady's throat and neck but did not come up to her chin. Among royalty, circlets of **gold** or **embroidery** helped hold the veil in place on the head. When a common woman was working, she wore a longer veil and tied it around her head or attached it to one shoulder and wrapped it around her head. When Norman fashions came to England after 1066, head veils became smaller and more open. The couvre-chef covered only the hair and sides of the face, not the neck as well. Metal or **cloth** circlets, called fillets, became a more common way to hold this veil in place.

In the middle of the 12th century, aristocratic women in Northern Europe began wearing a band of linen called a barbette. Their hair was braided and pinned around the head, and the barbette went under the chin and around the top of the head, where it was pinned. A veil or kerchief covered the pinned top of the barbette, and a small hat often went on top. The hat was called a coif, and it was small, round, and flat on top, perhaps modeled after the Byzantine ladies' hat. By the late 13th century, the coif hat had evolved into a little coronet. It was an open band that could be plain, like a narrow cloth fillet, or pleated to look like a white fabric crown. The barbette under the chin could be narrow or wide.

During the 13th century, the barbette and coif were the most common headgear among middle-class women, but aristocratic women developed a new style. They began to wear a hair net called a crispine, crespinette, or caul. It was made of expensive materials such as gold, **silver,** or silk carefully made into a bag to contain the hair close to the head. Crespinettes might be worn with a barbette or even with a coif, as well. Crespinettes made of coarser material such as flax became popular with the middle and lower classes into the 14th century. They were worn with fillets over braided and pinned **hair.** In France, craftsmen made artificial flowers to decorate ladies' headdresses.

Another late 12th-century fashion was the wimple. Instead of a barbette and coif, the lady wore a veil on her head and used another cloth, the wimple, to wrap and cover her neck. The wimple was made of fine linen or silk. It was pinned to the hair behind each ear, and it pulled snug up under the chin so that no skin showed on the neck. Wimples continued to be worn through the 13th century. In the early 14th century, hair was sometimes left uncovered, so the wimple became the most important headdress. Hair was often braided, coiled, and pinned by the ears, and the ends of the wimple were pinned tucked into the hair coils. Illustrations even show ladies with bare heads, but with their necks modestly covered with a large white wimple.

By the late 14th century, the pressure of fashion to keep evolving newer, showier headdresses pushed both the crespinette and the veil into new forms. Hair at this time was pinned into columns by the face and was sometimes uncovered. The new veil had ruffles thickly surrounding the outline

of the face. The new crespinette was a fancier turban-like cap made of ornate silk. It enclosed all the hair, which was pinned up on the head, and it was covered with embroidery and jewels.

Veils and wimples continued to be worn by lower-class women and the elderly long after they were out of fashion with the aristocracy. The wimple's modesty eventually made it part of a standard nun's headdress. Veils and head scarves never lost their function with working women in a town. They continued to wear them in traditional forms, untouched by fashion. Their veils looped around the head or were pinned or tied.

The practical hood never lost its use with working women, either. As the man's hood evolved into the long-tailed liripipe form in the 14th century, a type of ladies' hood, open like a veil, imitated it. Prostitutes were supposed to wear their hoods inside out or to wear only stripes and bright colors. Practical woolen hoods were used for outdoor work and for traveling in all of the late medieval centuries. The fashionable headdresses that evolved for court were highly impractical and easily damaged.

Ladies' headdresses of the 15th century were extravagant and complex. They were shaped by wires and integrated braids and rolls of hair into the headdress. In the opening of the 15th century, the preferred shape was a variant of the 14th-century column style. A fillet and wire mesh supported the hair in round coils just above the ears; because it featured a network of wire, the style is often called a reticulated (network) headdress. These fillets were elaborate, made of golden wire, and the cauls on each side were also highly decorative. After a few years, the tight round buns turned into larger cauls that covered the ears and presented the familiar pillar shape from the front. Between fillets, coifs, veils, and cauls, the hair was entirely covered. Another style in the same period, around 1410, created a turban of silk with extra padding to make its shape smooth and thick around the top of the head.

The next evolution of the headdress was even more artificial. Hair, nets, starched linen, and wire formed the side cauls into wings that stood out horizontally from the head. They were straight out in a line with the brows or shaped like wings or the top lobes of a heart. The summit of this headdress was covered with a light veil, often with scalloped edges. At its most extreme—around 1415—the wings stood out a foot or more on each side, like the horns on a Texas longhorn steer. Because the headdress was covered with gold mesh, jewels, and a frilled sheer veil, its effect was impressive and beautiful, but it was far from natural hair.

Fashion was now changing rapidly. By the 1420s, the cauls had shrunk, and the horns now formed a heart-shaped headdress called the bourrelet. Its wire framework stood up from the lady's head six inches or more on each side, and a silk veil fluttered from the tips. The bourrelet grew more elaborate over the next few decades. It was made with thick rolls of padded

silk over a wire frame, and the lobes of the heart stood up in graceful loops a foot above the face. Every variation of past styles was used: gold and silk netting, silk brocade, jewels, flowers, cauls to hold hair by the ears, and sheer veils. Turbans, made of silk and padded to be thick and round, were also worn by court ladies.

In the middle of the 15th century, at the close of the Middle Ages proper, illustrations show the headdress that is most famous in medieval caricatures: the hennin, or cornet. This cone-shaped hat, covered with rich silk brocade, first appeared in France around 1430. It was worn tilted back at an angle from the head, and it was draped with a light circular veil called a cointoise. The veil often draped to the forehead and floated behind; sometimes it covered the entire hennin and sometimes just the end, pinned with a jeweled brooch. English hennins were flattened on top like modern hats, while French ones were true cones that could be as tall as three feet.

In the late 15th century, the hennin's veil became more complicated. It was folded and starched, or supported by silk-wrapped wires, so that part of it stood up around the cone of the hat in two folds or wings and the rest of it floated behind. It is often called a butterfly headdress. Some forms used many complicated folds of starched veils that stood up from the wearer's head a foot or more. As the Middle Ages ended, the cone of the hennin became shorter and milder and its veil simpler. Sometimes a band of black velvet covered the hennin's front and framed the face, draping to the shoulders.

Italy's headdress fashions were always different, perhaps due to the warmer climate. The bulky, padded headdresses of the North did not fit into Italy's culture. When French ladies were wearing heavily padded, large turbans, Italian ladies are also shown in large, bulbous turbans, but theirs were probably not padded. They could have been formed on wire or wicker frames. The bourrelet style was smaller in Italy. The whole headdress covered less hair and allowed more air to circulate while draping a graceful veil behind leather-covered horns of hair. Italian ladies of the late 15th century also wore their hair long, enclosed in a silk sheath like a long braid down the back and covered on the head by net or silk damask. The hennin and the butterfly never caught on.

Men's Styles

Until the 14th century, men's head coverings were both universal and conservative. They did not change much for many centuries. There were a few basic styles of hoods and caps. Once court fashions began to offer options, the hats of the 14th and 15th centuries became elaborate, expensive, and rapidly changing.

The standard head covering through most of the medieval period was the hood. The hood was a simple cloth cap with a pointed top, made in one

piece, with a short cape that surrounded the neck and covered the shoulders. It was shaped like a cone with an oval cut out for the face. The hood was an all-purpose covering for all social classes and seasons. Monks nearly always wore hoods, also called cowls, which formed loose folds of fabric when not drawn up over the head. Some hoods pulled over the head in one piece, and others buttoned up the front.

The 12th-century Anglo-Norman laborers in illustrations usually wear simple Phrygian caps, a universal style: rounded cloth caps that tended to stand up with a point like modern ski caps. Anglo-Saxon working men may also have worn simple domed hats made of wool felt with turned-up brims.

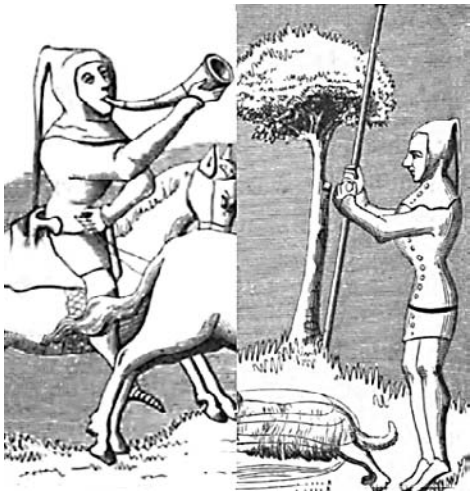
By the late 13th century, nearly all men, with the exception of monks, wore a close-fitting, rounded cloth cap that tied under the chin. It was called a coif, and it was worn indoors and outdoors, plain and covered by other hats. **Knights** wore them under armor, and kings wore them under crowns. Men may have worn them to sleep and even to bathe. Coifs were usually made of linen. All pictures of men wearing coifs depict them as white, never colored or decorated.

Some kinds of hats were never part of high fashion but can be seen in illustrations of men at work. Physicians around 1270 wore a small round skullcap with a beanie point. They had cloaks with hoods that covered the caps when they were outdoors. Many farm laborers wore straw or felt hats with brims. A medieval English straw hat looks very similar to such hats in the 19th century; the crown and brim are practical for shading from the sun. During the 13th century, **Jews** were forced to wear special hats to make them visible. The hats were generally yellow, either pointed or square.

In the late 13th century, the hood went through an evolution that began with a lengthening of the point. The point became a long tube that hung down the back; it was called a liripipe. The length of a liripipe varied between 10 inches and several feet. Hoods, worn universally in all ranks of society, were often made to match the tunic and coat. It was fashionable to wear all one matching color, perhaps as a way of advertising one's ability to buy so much fabric all at once.

Around 1300, someone experimented with turning the hood's cone around so that the hole cut for the face was, instead, around the top of the head. The bottom flare of the cone, which had formed a shoulder cape, was now a large ruffle on one side, and the liripipe point drooped out to the other side. If it were long, it hung down or might even be wound around like a turban. This style of turning a hood into a hat, with a fresh hatband around the forehead, allowed the wearer to tuck, flop, point, and turn the cloth into different shapes. The liripipe, now coming out of the side of the hood, could wind around the neck like a muffler or wrap around a hat. Cut with a small point and a wide cape, the hood could become a hat that

The chaperon's versatility must have been one reason for its lasting popularity. By making its underlying hood in varying sizes, hat makers allowed the wearer to let the liripipe dangle, wrap it around the crown, lay it across the shoulders, or tuck it into the back. (The British Library/StockphotoPro)



The hood was the basic hat of the 12th through 14th centuries. It could be made into a close, round cap called a coif, or the back could be lengthened into a trailing point. It could be small and tied under the chin, or its yoke could be generous enough to warm and cover the neck and shoulders. All professions wore hoods of some kind. In this picture, hunters wear hoods with long liripipes and generous yokes. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

looked like a ruffled cock's comb. Often known as a chaperon, it became the predominant men's hat of the 14th century.

During the 14th century, especially among the middle classes, there were other hat fashions, sometimes still worn with liripipe hoods for extra warmth. One kind of hat, called a bycocket, had a brim that turned up in back but stuck out in front like a long bird's beak. Fashionable women in some places also wore bycocket hats. These hats, for court use, were as gaudy as other kinds. The bycocket hat could be covered with peacock feathers or its brim lined with fur. The crowns grew taller and the brims grew longer and more beaked. The bycocket often needed leather thongs to tie it down if a man wanted to wear it outdoors.

The crown of a beaver hat was round and flat, and the brim was often lopsided. Made of felted wool and beaver fur, it was fuzzy, not stiff and shiny like 19th-century mercury-treated beaver hats. Other humble hat traditions grew. There was a simple round hat with a turned-up brim, perhaps favored by old men in cold climates. Some hats, practical for different professions, had wide brims to shade the sun or front brims to shade the sun while not blocking other visibility. During this century, pictures of men in all trades show all kinds of hats and brims: front, all around, stiff, floppy, wide, and narrow. The coif and hood slowly became less necessary.

Students in 14th-century Italian **universities** wore small white coifs, but in illustrations the coifs are shown with black hats over them. The hats have stiff black bands around the head, and the crown stands up from it. In some styles, the crown stands up straight and square, and in others, padded and round. In some images, the coif has been made black to match the hat. This kind of hat came to stand for students, and it is the forerunner of the modern graduation cap.

Musicians and **minstrels** wore more colorful hats based on the common styles. Their liripipe hoods were brighter and patterned and had larger combs. If they wore a felt hat with a brim, it was parti-colored. Their headgear was an advertisement for their profession; they lived in the spotlight, and they dressed to look like they did.

The 15th century, at the close of the Middle Ages, brought great variation in men's hats. Travel was now faster and farther than before. Fashions in one part of Europe came to other parts within a few years. This created a greater variety than when hat fashions had depended on local tastes alone. During this century, hats could be of fur, velvet, wool felt, or bright silk.

The chaperon was a development of the hat made from a liripipe hood. It was a stuffed roll of fabric around the brim of the head, called a rondlet, with a liripipe hanging down as a tail. From inside the rondlet came some folds of cloth similar to the cape portion of the hood. These folds were flipped to the back so that the tire-like rondlet brim showed in front and a cape-like back hung down. The liripipe might be long or short, and it had some use as a handle. As the years went by, it turned from a tube into a long streamer and became known as a becca. The floppy parts of the hat, called the gorget, were groomed into neat folds at the side or back, and sometimes they fell toward the front, over the rondlet. In tipping his hat in salute, a man lifted the rondlet and held the becca, the streamer, in his other hand.

The houpeland, a man's surcote of the 15th century, was a large, grand tunic that came to the knees or feet. It had a collar that often rose high on the neck, so high in extreme cases that it covered the back of the head. A man with such an extreme houpeland needed only a small cap to top off his collar. While some houpelands were worn with extreme chaperons, others were worn with small caps decorated with fur or feathers.

The coif evolved into a small cloth cap without ties until it was gradually discarded as unnecessary. The hood, too, after its evolution into the liripipe chaperon, lost its practical function among the fashionable. Hoods on cloaks remained practical as outdoor wear for much longer. Indoors, the coif and hood merged to become the nightcap that persisted into the 19th century. A specialized form of hood became standardized as the jester's gear; it had ears, a comb, or points with **bells.** It was made of gaudy material, and it continued to mark the profession for a century after the hood had gone out of fashion.

A tall felt hat, shaped like the end of a hot dog, came from Paris during the middle of the 15th century. These hats were at first all crown and no brim, but, as the style was adapted in other places, they developed wide brims, wide and tall crowns, and even curved brims. This type of hat continued to develop and became a dominant style in the Renaissance.

Large cushioned hats were also worn by fashionable men. The rondlet was still padded, sometimes thickly, and the crown of the hat was also

padded. Some extreme hats looked like a hamburger bun worn on the head, with two thick layers of padding.

The last distinctive hat of the late Middle Ages, into the Renaissance, came from Italy. It was made of black velvet (black felt for the less wealthy), and it was a soft hat with a low, flat crown and a brim that was often left turned down, toward the face. It was called a bonnet.

See also: Cloth, Clothing, Hair.

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Heraldry

Heraldry is the system of graphic markings that identified an individual **knight** or a group of fighting men who belonged to a lord. Originally, the word encompassed all the duties of the king's registration officials, the heralds. Over time, it came to mean only the system of coats of arms that the heralds registered.

The coat of arms—the design displayed on the shield, a tunic, or a banner—became important in medieval warfare after **armor** began to cover a warrior's body and face. It was harder to tell friend from foe or to determine if a commander had been killed. The system of heraldry developed from simple markings to a complicated graphic history of family inheritance, and its importance went beyond the battlefield because it defined who belonged to a certain privileged social class. Coats of arms seem to have developed between the Second and Third **Crusades.** At the same time, the hot sun of Palestine forced knights to adopt the surcote (or surcoat), a tunic that covered the iron rings of their mail coats. Knights could display their personal and family insignia on this tunic as well as on their shields.

Heraldic designs were hereditary, belonging to a family and passing from father to son. They were used only in families of nobility, which meant that

the families held land in fief from the king and bore **weapons** in the king's service. Foot soldiers and archers did not own land, even if they fought in an army. Renting a farm did not bring nobility, since it was not a favor granted by the king. Since noble families were denoted by the land they held from the king, their surnames came from these manors. In French, an aristocrat's surname would follow his baptized name as *de,* "from," his manor. In German, the name was formed the same, with *von,* also meaning "from."

As the Middle Ages passed, rank became hereditary in many cases, and the loose system of names such as baron, knight, or count became standardized in a hierarchy. Royal control over who was noble and who could have a coat of arms was usually delegated to the king's herald. The herald's original task had been to tally fatalities in a battle and report them back to the king.

At first, only shield designs were created and registered, but later there were also helmet crests. Roman and early Germanic warriors had often used a design, such as a boar, an eagle, or a wing, on top of a helmet. Medieval crests began as fans with an abbreviated coat of arms on top of the helmet. Only men could bear a crest on their arms.

The highest level of aristocracy developed designs that included crests, mottoes, and supporters. In this full form of their coat of arms, the shield was in the center, and usually two figures stood on either side, as if holding it up. They were usually animals, real or mythical, or fanciful humans such as wild men, angels, or mermaids. The crest was shown on a helmet, above the shield, and it often had a wreath at the bottom showing the dominant colors of the arms. A banner displayed the family's motto.

When a woman from a noble family married into another family with a coat of arms, she kept the use of both arms. The married couple displayed both insignia on their arms, in different fashions depending on whether the wife was the heiress or if her brothers were the primary heirs. The process of combining the arms was called marshaling the arms. When families with marshaled arms married others with arms, the arms were again combined so all could be displayed, each in a segment called a charge. In extreme cases, a family's shield came to display upward of a dozen small armorial charges. There were very strict rules governing how this was done.

Noble families developed simpler badges, in addition to these complex coats of arms. Badges may have been in use before the full development of heraldry. They consisted of a single charge that could be used to mark the family's **servants** and dependents. Women were free to use the family's badge, though not the crest. Badges displayed an even wider variety of designs than shields. The red and white roses of Lancaster and York were these families' badges. Other noble English badges of the Middle Ages included an acorn for the earl of Arundel, a silver crescent for the earl of Percy, a **castle** for King Edward II, and a chained antelope for King Henry V.

By the 14th century, the use of **seals** to sign documents pushed commoners to adopt insignia similar to aristocratic badges and coats of arms. Monasteries, guilds, corporations, and towns designed arms for their seals. Heralds did not control arms in France, Germany, and other continental European countries as they did in England. People were free to design and adopt a coat of arms as long as it followed the rules of blazon that explained how to do it properly. Over a million designs were in use before autograph signatures took the place of seals in verifying documents. In France, some wealthy peasants adopted arms for their seals.

At the same time, corporations and craftsmen created trademarks. One development of the medieval office of herald is the modern registry of trademarks. An Italian lawyer, Bartolo di Sasso Ferato, wrote a treatise on heraldry as a legal field. Although he restricted the noble use of arms to grants by kings and emperors, he applied the same rules to trademarks, watermarks, and seals.

Heralds

Heralds carried messages for the king during times of war, wearing the king's arms and carrying a white stick. When the herald was not carrying messages, he took notes on who had been knighted and the design of each new knight's arms. Heralds became specialists in all matters pertaining to coats of arms. They also identified acts of bravery during battle by identifying each knight's arms and took note of which knights had been killed in battle. After the Battle of Crécy, French heralds counted the dead and delivered to the English king a list of which French knights had been killed. Heralds raised banners of victory, and losing heralds handed over their banners to the victorious heralds. They did not take part in battles, and did not receive a share of the spoils, but were compensated with **gold** or **houses.** The leader of the heralds was called the king of heralds, or king of arms. The king of arms proclaimed the start of a **tournament,** and his heralds kept track of which knights had honored or disgraced themselves and which had been killed.

By the 15th century, heralds wore a special short robe called a tabard, which had the king's coat of arms on it, divided into quadrants across the wearer's chest. The sleeves, too, were divided into sections with the king's arms on them. Heralds always wore badges of office, and some carried batons or scepters of authority. The king of arms had a special crown that was worn at the real king's coronation. Heralds did not carry trumpets, but they were usually accompanied by a trumpeter to get attention before their announcements.

In England, kings of arms oversaw different regions. The chief herald for the southern region was called Clarenceux, and the chief herald for the

northern region was called Norroy. Some dukedoms and earldoms also had chief heralds: Lancaster, Aquitaine, Ireland. In 1415, King Henry V created the Order of the Garter, the highest honor, and the chief of all English heralds after that was called Garter, King of Arms. These chief heralds did some embassy work, helping arrange treaties, and some census work, riding out to count noble families.

Heralds needed to witness and register aristocratic **weddings** because, when the bride and groom both inherited coats of arms, their children would inherit a combination coat of arms with both designs quartered. After several generations of aristocratic **marriages,** children could inherit arms with many quarterings, and it became hard to keep straight the complexity of the inheritance. It was the herald's job to know the rules and keep **records** of the families.

Heralds were paid fees for the grand occasions when they worked hardest: coronations, weddings, christenings, knightings, treaties, and tournaments. Kings of Arms were able to collect the weapons of the losers at tournaments, and they also had a legal right to the abandoned possessions of rebels who fled a battle. Among specifically English customs, an aristocratic bride gave the top part of her wedding garment to the King of Arms who attended as witness.

By the time the use of **gunpowder** had changed warfare so that heraldry was no longer as important in identifying the dead, heralds were established as the court recorders of all honors. They kept records of who had been knighted, who had been made lords of any kind, and new arms and changes in coats of arms. In England, they controlled which wealthy families had a right to use arms.

Heraldic shield painting was a craft of its own, separate from armor-making and **painting.** In German, they were called *Schilters,* or "shielders." The shield painters had their own guild. They worked in tempera paint on lime-stiffened linen glued onto the wooden shield. They also soaked leather in oil and pressed the soft leather into shapes resembling the bodies of the **animals** they needed to represent.

Heraldic Designs

A herald registered a coat of arms as a verbal description called a blazon. There were precise terms and conventions to make plain what was meant without a drawing. The color of the most important part of the field was always mentioned first: the upper part, or the right side, or, in a quartered coat, the first and fourth quarters. Other design elements were listed in a set style so every herald could reproduce the arms by its description, no matter how complicated it sounded to the untrained. One part of understanding heraldry is learning the terms they used, which are used in the same form

today. Most of the words come from medieval French or Norman French as spoken at the English court. (In the conventions of heraldry, word order is often French, so the adjective follows its noun.)

The background color of the shield is called the field of the coat of arms. The design is called the charge. Some medieval coats of arms had no charge and consisted only of a single field or a field divided into two or more colors by partition lines. The charge could be a geometric design called an ordinary; it could also include an animal or some object.

The favored colors of the Middle Ages became the standard colors of heraldic fields. They are known as tinctures. The first two are the metals—**gold** and **silver.** In plain terms, they are yellow and white, but they are called *or* and *argent*. There are four true colors in the tinctures. Red is called *gules,* a medieval French word that meant "throat." Gules can be any sort of red, dark or light. All blue is called *azure,* the medieval name of a place in Persia where the blue stone lapis lazuli could be found. Green and purple, not common colors in coats of arms, are known by the French words *vert* and *purpure*. Black, a very common heraldic color, was *sable,* named for a black mink—technically, it belonged to the group of fields named for furs.

The fields named for furs were usually two colors, to imitate the fur's appearance. The ermine is a white mink with a black tail, and, when its furs

Geoffrey, count of Anjou, married the daughter of the king of England when he was only 15. At his marriage, the king knighted Geoffrey and granted him the right to use lions as his badge. It was one of the first royal grants of heraldry. In his enameled effigy painting, Geoffrey's shield clearly displays the lions. The practice of heraldry soon became much more formalized. (The Print Collector/ StockphotoPro)

were stitched together, the white predominated, with black streaks mixed in. The heraldic field called ermine imitated the design of black spots or tails on a white background, but the entire design was considered a field since it represented a common fur pattern. Similarly, vair fur was made from a gray squirrel with a white belly and incorporated many small pelts stitched into a lining. The heraldic field of vair showed blue and white alternating in a pattern like a row of cups, and three or four rows were used on the shield.

The field did not have to be a solid color or a fur. It could be primarily a tincture but with a small design scattered across it, such as diamonds or the French fleur-de-lis. This would be in addition to the main figure, the charge, on it. The small design was described as *semé,* or "seeded."

The field could be partitioned in seven basic ways, called ordinaries. A horizontal line was called a fess, and a vertical line was a pale (from the word for a fence as we use it in the expression "beyond the pale"). A diagonal line was a bend, and, if its top end was to the left corner and its bottom end to the right, it was simply called a bend. If it ran the other way, top end in the right corner, it was a bend sinister. In Latin, *dexter* means "right" and *sinister* means "left." An upside-down *V,* like the tip of a mountain, was called chevron. The last two ordinaries divided the shield into four parts. With vertical and horizontal lines, like a plus sign, it was called cross or quarterly, but when it was made with diagonal lines, it was saltire. A coat of arms using any of these ordinaries is described, in the blazon, as being partitioned "per" the ordinary: "azure and or per fess."

The kinds of lines that could be used as ordinaries were also standardized. In addition to plain straight lines, the partition lines could be engrailed or invecked (scalloped, with the scallops turned upward or downward), embattled (shaped like battlements), indented (zigzag), or wavy (a long, slow wave in the line). As the need to find unique coats of arms increased in the late Middle Ages, and into the present, additional partition lines were invented, including those that look like a carpenter's dovetail joints, France's fleur-de-lis, or small clouds joined together (known as nebuly).

These partitions could also become part of the charge or a more complex division of the arms into sections. When the partition formed the basic design, it was called an ordinary. A bend might not be just a partition line; it could also be a wide diagonal stripe. A fess could be a wide horizontal bar, and a pale could be a wide stripe down the middle of the arms. The chevron, cross, and saltire also could be made into wide stripes. Additionally, a chevron could be turned upside down into a *V,* and it was called a pile.

Other shapes formed ordinaries. A horizontal line could divide the shield not across the center, but toward the top. It was not a fess then, it was a chief. A canton was a square in the top corner of the arms; it was supposed to be one-third of the chief, so it was smaller than a section of a quarterly. A bordure divided the arms into a center design and a thick border. Lozenges

were diamond shapes, roundles were circles, billets were rectangles, and flaunches were circle sections cut into each side of the field. Variations of these basic shapes complicated the descriptions: a border within a border was an orle, a diamond within a diamond was a mascle, and a circle within a circle was an annulet.

The designs could be varied more by forming these shapes not with plain straight lines, but with special lines: wavy, embattled, indented, invecked, and engrailed. A wavy chief was different from a wavy fess, and both were different from a chief or fess formed with a scalloped engrailed line. There were crosses embattled, indented, and engrailed, as well as special crosses: botonny (with three circles on each arm, representing the Trinity), potent (with *T*-shaped arms), and flory (shaped like the top of the French lily).

The charge was often more than a geometric ordinary. A wide variety of **animals** were favored for coats of arms. The lion was the most favored, especially for royalty. It was not native to Europe, and it was only seen alive in royal menageries or depicted in traditional bestiary **books.** As a result, most medieval heraldic lions did not look much like real lions. Very similar beasts might be called tigers or leopards. The chief artistic difference was that lions had to be standing up, called rampant. In French heraldry, any lion standing on four feet was a leopard, even if other nations still called it a lion.

A lion rampant was standing on its back legs with its front paws in the air, claws outstretched and mouth open. A lion passant was shown walking, a lion statant was standing, a lion sejant was seated, and a lion couchant was lying down, with his head up. They could be gardant, looking forward, or regardant, looking back toward their tails. Artists took liberties with animals to give them variety. The lion passant might have two tails or two heads.

Animals that took part in aristocratic hunts were the next most popular heraldic animals, and they had the advantage of not implying royalty. When a family's surname or estate sounded like an animal, it was often incorporated into the arms, such as bears for Barnard. Wolves, boars, bears, and stags were the most popular heraldic quarries. Horses and dogs also figured in arms. Bulls, not hunted but viewed as noble and strong, could be used. Like lions, all these animals could be posed standing, sitting, or walking and could look forward or back. Heraldic painters could differentiate each coat of arms, making it unique in an increasingly crowded field of registered designs.

Some birds were common figures as charges. Eagles were by far the favorite choice. They could be in different positions, but most were shown with the belly toward the viewer, wings spread and head turned to one side. This view was called displayed. Some eagles had two heads. The only other birds that figured in medieval heraldry were the mythical phoenix (shown on its fiery nest), the falcon, and the raven.

Monsters were equally popular. There were monsters borrowed from classical mythology, such as the dragon, the centaur, and the unicorn. Drag-

ons and unicorns were the most popular heraldic monsters, and dragons appeared on some English and Welsh battle flags. Other monsters were combinations of animals. Griffins had a lion's body, an eagle's wings, and a head of an eagle but with a lion's ears. Their back feet were lion's paws, and their front feet had eagle's claws. Some other hybrids were the invention of artists. Lions could have wings, or they could have a back half like a fish—literally a sea lion. Wings were particularly popular; there were winged stags, goats, and bulls, as well as Pegasus, the winged horse from Greek mythology.

Some plants could feature in coats of arms, chiefly trees and flowers. The white and red roses on the coats of arms of Lancaster and York, both branches of the royal English family, gave the name "War of the Roses" to their 15th-century civil war over the throne. These heraldric roses had five petals. The French king's emblem was a stylized lily, with three petals, called the fleur-de-lis.

Castles and **ships** made their appearance in some coats of arms. Other objects sometimes appeared, particularly if they had a connection to the knight's profession: lances, swords, buckles, and gauntlets. Stars, suns, and moons were exalted enough to be used in early coats of arms. Other random things could appear if the object's name resembled the family's name. In medieval England, the earl of Derby's family name was Ferrers, and, by the late Middle Ages, *farrier* was recognized as a French-derived word that meant a horseshoe specialist, so the earl's coat of arms prominently included a horseshoe.

As time went on, and coats of arms proliferated, less exalted objects were acceptable as charges. Humble animals like the hare, otter, and fox, or lesser birds like swans or herons, were depicted on less aristocratic arms. As towns created coats of arms, emblems of their location or trade or illustrations of their name became acceptable. The arms of Oxford shows a cow walking across water. A **city** with a harbor would use a ship, a dolphin or whale, a fish, or a mermaid as the charge. Religious coats of arms used not only the cross, but also lambs, angels, and bells. Craft **guilds** used images of their trade's **tools** or products.

The shield's field was divided into zones of hierarchy. In medieval Europe, people considered that nearly every thing had an order of value, so it was natural to make sure hierarchy was specified on a coat of arms. The tinctures had a hierarchy; or (gold) was at the top and sable (black) at the bottom. Gules (red) was nobler than azure (blue); vert and purpure were mere colors and did not have rank at all. On the shield, whatever was on top was higher than what was on the bottom, and the dexter was higher than sinister. Other positions of placement rank were calculated from these principles.

The sons in a family used the father's coat of arms, but each son had a marker, called a difference, to show his birth order. The difference was

superimposed on the family's shield in an upper corner. The first son's shield had a horizontal stripe with three vertical bars hanging from it, but when he inherited the estate on his father's death, the difference was removed from his arms. Younger sons retained their designated differences: a crescent for the second son, a star called a mullet for the third, a bird called a martlet for the fourth, a circle called an amulet for the fifth, and so on through a ninth son, who bore an octofoil, an eight-lobed flower. The second son of a second son bore a shield with a crescent inside a crescent.

Heraldry was one part of the Middle Ages that developed more after its initial importance on armor died out. After coats of arms were adopted by commoners, towns, and corporations, registries had to keep track of them. Rules governing the marshaling and creation of noble coats of arms proliferated as kings created new titles and more families intermarried. Long after heraldry had any practical purpose, heralds continued to maintain registries and publish treatises on the rules of blazon.

See also: Hunting, Knights, Monsters, Seals.

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Herbs. *See* Gardens

Holidays

Feast days, dictated by the **church calendar,** were the holidays of the Middle Ages. A few pre-Christian holidays lingered, such as Midsummer, Harvest, and Yule, but the church had absorbed the customs of these holidays into days to honor **saints** or commemorate events in the Gospels. Feast

days often paired with **fast** days, but fast days were solemn, not celebratory, occasions. Feast days called for special food, days off work, traditional **games,** and **dances**. The two big holidays of the Christian season were Christmas and Easter. Easter, although it kept its pagan name in English, was predominantly religious and solemn. Christmas, although it included a mass for Christ's birth, was predominantly secular and rowdy.

The year was a blur of feast days, averaging one per week, in addition to Sunday. Medieval workers who worked on public projects such as **cathedrals** had these days off, as well as a half day before. If a holiday fell on a Friday, the half day of work on Saturday was not worth beginning, and the workers had a full, long weekend. In 14th-century England, the archbishop of Canterbury declared 40 official feast days when workers were off. Christmas week was a cluster of feast days: Christmas, Saint Stephen, Saint John, Holy Innocents, and Saint Thomas of Canterbury. Easter and Pentecost (or Whitsun) included not only the original Sunday, but also three days after.

Although workers had feast days off, local parishes only celebrated the day of their own patron saints. A special Mass was obligatory, and there were other traditions such as carrying the saint's image or **relics** in a procession through the town or around the church. Regional **fairs** and dramatic festivals were scheduled according to these saints' days. Corpus Christi Day, which was very close to midsummer, the longest day of the year, was the day when York, England, put on its cycle of plays that dramatized the Bible. It was a new holiday beginning in the 14th century.

Autumn and Winter

Autumn had a cluster of saints' days that marked points in the harvest calendar. Saint Michael's Day, September 29, was a saint's day celebrated widely in Europe. Many churches and **monasteries** honored Saint Michael. In England, the day was called Michaelmas and was celebrated with a traditional feast of roast goose. Many country fairs were held at Michaelmas. The shoemakers' patron saint, Saint Crispin, had his day in late October, so festivals honoring him were often put on by cordwainers' (shoemakers') **guilds.**

Some autumn holidays blurred the line between pagan and Christian. November 1 was All Saints' Day, and November 2 was All Souls' Day, to honor all saints and pray for all deceased souls to be freed from purgatory. But the pagan holiday of Samhain, the death of summer, was a tradition that persisted. When the Anglo-Saxons and Franks were converted to the Christian religion, the Pope's policy was to incorporate their customs into some kind of Christian practice. The Christian saints' days encouraged people to think not of the death of summer or of a god but of saints and of sinners like themselves. In some regions, on the eve of All Saints' Day, also called

All Hallows' Day, children wore masks and went door-to-door, begging cakes for the souls of the dead. The Celts had built huge bonfires for Samhain, and medieval peasants continued to make bonfires. They often made a corn-shock king of the harvest. Regional customs differ; some harvest kings were burned in a bonfire, while others were kept until spring, when the dummy's head could be used as a football.

Saint Martin's Day was on November 11. Martinmas was the day to pay an annual rent, and it was the start of the fall butchering and meat-smoking season. In some places, children went door-to-door asking for alms. Beef or pork slaughtered on Martinmas could be salted and smoked and preserved until the feast of Easter. November 25 was Saint Catherine's Day. Saint Catherine had died in the fourth century under torture, on a wheel. The theme of wheels dominated the holiday. Any kind of wheel game or show was popular, and, over time, the burning "Catherine's Wheel" firework was developed.

The Christmas season began at Advent, four Sundays before Christmas, and concluded with the Feast of the Epiphany on January 6. Advent was a fast season, a time of prayer and repentance before the holy feast days. Saint Nicholas's Day occurred early in Advent, on December 6, but it was not directly connected with the nativity during the Middle Ages. Children received gifts on Saint Nicholas's Day, since, in legend, Saint Nicholas had raised three children from the dead and had secretly given gifts to the poor. It was a rare feast day during the fast season.

Christmas lasted 12 days in medieval tradition. The Germanic tribes of the North had always celebrated a mid-winter holiday; pagan Yule became the festival of the birth of Jesus. The pagan traditions continued so that the holiday was always a strange blend. Yule had centered around burning a very large log that would take many days to be consumed, and it required a feast of roast boar. The Feast of the Nativity, as Christmas was officially called, expanded to include the same things, but the log was often still called the yule log. The log was doused with alcohol and carefully kept burning for 12 days; its ashes were considered lucky. **Castles** and **houses** were decorated with greenery such as holly, ivy, and mistletoe, as they had been in pagan times. There were no evergreen trees indoors; the German tradition of the Christmas tree is postmedieval.

Feasting and drinking were the main events, to make up for the Advent fast. Royal Christmas feasts in the Middle Ages could be unbelievably vast, such as King Richard II's feast of 2,000 oxen. But Christmas had special foods not seen on other feast days. In England, one was the mince pie, a pie made with finely chopped meats left from several butcherings, spiced and mixed with dried fruit. Some Christmas pies had pastry models of the baby Jesus on top. Another English tradition was the roast boar, or perhaps just the boar's head. Plum pudding was a treat of the 13th and 14th centuries,

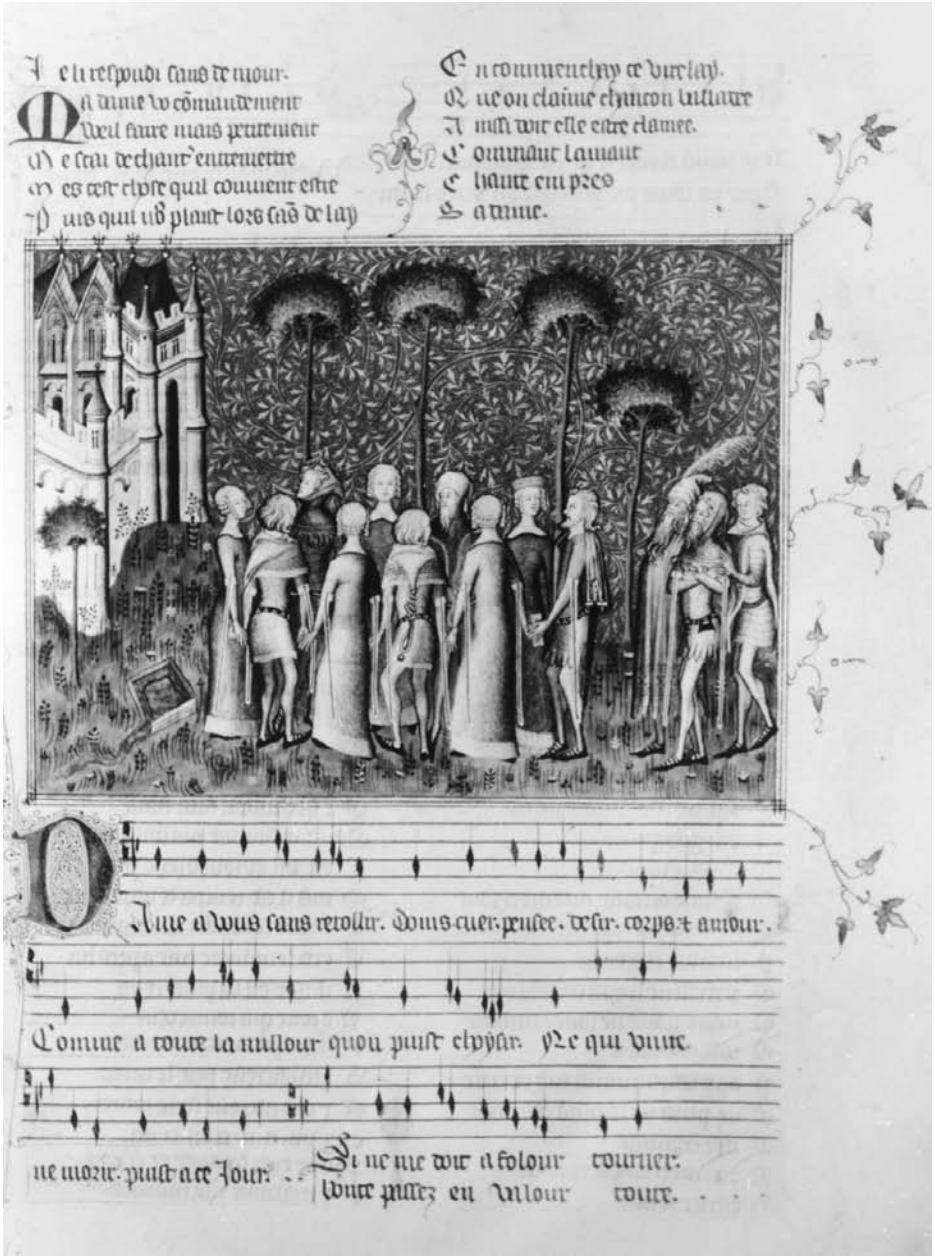
when increased trade brought dried plums from Spain and Portugal. It was made with dried plums, breadcrumbs, beef broth, wine, and spices and boiled until thick. This early plum pudding was probably the beginning of Christmas fruitcake, with the addition of more flour. Put into a bladder, it could be steamed or baked. Wassail was a special English Christmas drink, a frothy brew of ale, apples, and spices.

Churches had Mass three times on Christmas: midnight on Christmas Eve (the Angels' Mass), at dawn (the Shepherds' Mass), and at midday. It was, in this sense, a religious holiday. But in Northern Europe, the season was not primarily devout or solemn. In addition to the feasting and drinking, there were traditional parties and games. People played blind man's bluff or tug of war and danced to carols sung by the group. Indoors in limited space, these were mostly ring dances in the center of the hall. Some halls elected a temporary king, the lord of misrule. This mock sovereign gave entertaining orders for games, dance, and drama.

English tradition had included mummery, simple folk drama with masks, since pagan times. Mumming plays were primitive and often included mock sword fights and dances. Men dressed as **women** for certain stock characters, and eventually Christmas plays became a time for both men and women to dress as the opposite sex. Mummery led to other uses of disguises, and, by the 15th and 16th centuries, aristocrats were putting on "disguising" parties. Since Christmas was a time of rowdy behavior and heavy drinking, some use of masks was illicit. Town patrols had to be on the lookout for masked men using their anonymity to break into houses.

By the 13th century, many places in England and France had developed a custom of electing a boy to be temporary bishop. He was usually a boy from the cathedral choir **school,** so he knew the songs and prayers. He was elected boy bishop on Saint Nicholas's Day, since Nicholas was the patron saint of children. He continued in this parody office until he presided over the Mass of the Holy Innocents, which commemorated Herod's slaughter of the baby boys around Bethlehem. In some regions, churches limited the custom to Holy Innocents' Day and the day before. Some boy bishops preached a sermon for the Holy Innocents' Mass, and the boy bishop might give a benediction or lead a procession at other services during his reign. He wore a mitre, gloves, and robes, and he impersonated the bishop at mock visitations at other churches and manors in the area. These visitations were parties and were often occasions for gifts and entertainment. The boy bishop might give orders for certain games to be played.

In Italy, Christmas lacked the Germanic Yule tradition and was always a more religious feast day. Francis of Assisi, who may have had professional **music** training, wrote devotional poems set to music. They may have been the first true Christmas carols, although they were not technically carols. Francis wanted to emphasize the humanity and divinity of Christ to combat



Medieval Christmas music had two forms: the secular carol and the religious hymn. Carols were traditional dance music; they were played and sung at feasts and parties so that people could join hands and dance in circles. Early written music for a Christmas carol dance is shown in this picture. Saint Francis of Assisi began the practice of writing special devotional music, in the common language rather than Latin, for Christmas. Songs associated with Christmas maintained this dual nature from medieval into modern times. (Art Resource, NY)

Manichean teachings in 13th-century Italy. He taught his disciples to write folk music to teach doctrinal and devotional ideas to the common people, and part of the Franciscan mission throughout France and England was to write Christmas songs. Francis also enjoyed staging a nativity play for the villagers, complete with manger, **animals,** and a real baby.

During the 15th century, more devotional Christmas songs were written in many languages. The early English ones often meditated on the personal feelings of Mary when the angel announced the coming birth of her baby. Other early songs talked about the exotic riches of the Magi whose feast was celebrated at the end of the season. By the end of the Middle Ages, Christmas songs were a major part of the holiday's traditions.

December 26 was Saint Stephen's Day, to commemorate the first Christian martyr. Because legend said a wren had given away Stephen's hiding place and led to his death, in some places, boys caught and killed wrens. Farmers bled their **horses** and other draft animals on this day. December 28 was Holy Innocents' Day, a fast day. In some places, children were whipped to commemorate the slaughter of **babies** in Bethlehem. Other places gave children more freedom or special prayers.

On New Year's Eve, some places had a disruptive custom called the Feast of Fools. It may have developed within the church as early as the 11th century. A blasphemous party began after the Latin service said, "He has put down the mighty from their seats and exalted the humble." With even the priests joining in, they sang discordant songs, played dice in church, and ate food on the altar. Monks and priests wore masks or turned their vestments inside out and joined in the unruly singing and dancing. In France, a donkey was brought into the church to commemorate the flight of Mary and Joseph into Egypt, and the donkey became part of the songs and mayhem.

In some places, people gave gifts for January 1, the New Year. Since different regions of Europe recognized different beginnings of a year, there was no unified, traditional way to mark the day. As international business grew and merchants needed a firm dating system, the Roman tradition of beginning the year on January 1 was revived. It was not part of the liturgical or folk customs calendar.

The Feast of the Epiphany closed the Christmas season for most, although some considered the season not to be over until Candlemas. Epiphany commemorated the arrival of the Magi to visit the infant Jesus, and churches sometimes put on a miracle pageant to act out the event. In England, it was also called Twelfth Night and was the gift-giving occasion. In some places, peasants lit 12 bonfires or 12 small fires and one large bonfire. In halls, 12 candles substituted for bonfires. A traditional cake for the Twelfth Night feast had a pea and a bean baked into it, and the man and woman who received them became the king and queen for the evening. A master of ceremonies led games and mumming plays in which people were masked as animals.

On February 2, medieval churches commemorated "the purification of the Virgin," when the infant Jesus was presented at the temple. The day was informally called Candlemas. Villagers in a procession brought a penny and a candle as gifts to the church, and the priest blessed candles for them to take home and use in times of need.

Spring and Summer

The Easter season began with Shrove Tuesday and a three-day festival called Shrovetide or Carnival. In French, it became Fat Tuesday, *Mardi Gros* (or *Gras*). The 40 days before Easter were the great fast season of Lent, and, on Fat Tuesday, there was a feast to precede the fast and consume meat that might spoil. The three days of Shrovetide were for revels and play of all kinds, including masked dramas. Schoolboys staged cockfights.

In England, Shrovetide was the other season when mummery, a primitive drama using costumes and masks, was traditional. In Germany, too, it was traditional to act out a drama of killing a man. The story as adapted to Christian times varied; sometimes it was a wild man, sometimes an enemy, who was killed by a group of swordsmen, and then a doctor brought the man back to life. It may have begun as a pagan custom symbolizing the death and rebirth of summer.

Ash Wednesday began the season of Lent. It was a day of repentance after the license of the festival. At church, after confession, the priest marked the penitent's forehead with holy oil and ashes. Lent was the fast season. No meat, eggs, or dairy products were permitted, although toward the end of the Middle Ages some dairy-dependent regions bought indulgences to permit the use of butter in cooking. **Fish** and legume-based pottages were the foods of Lent.

The main focus of Easter week was its church services. It was a more solemn holiday than Christmas; there was no tradition of revelry or games. The church focused on using dramatization of the historical events outlined in the gospels to teach the illiterate people the story. A week before Easter was Palm Sunday, and priests uses broad palm leaves in a procession in church. In places without palm trees, they used local substitutes. On Thursday, most fires and lights were put out, except for one left burning at the altar.

Maundy Thursday was a traditional time for kings and other lords to perform rituals of humility. Some washed the feet of the poor; King Louis IX washed the feet not only of **beggars,** but also specifically of lepers. The poor were brought into the house, and they were given a simple Lenten meal of fish and bread. Then they received money, traditionally one penny for every year of the lord's age, and a new shirt. The almoner who oversaw alms then began to wash the feet of each one, followed by the lord himself using rose water.

On Good Friday, the Mass reenacted the story of the Crucifixion of Jesus. The story was sung in Latin, and different monks or choirboys took the roles of various actors. There was some limited dramatic action, although in the Middle Ages they did not go as far as to play out the Crucifixion. For example, when the choir chanted that the Roman soldiers divided up Jesus's clothing, some choirboys might be assigned to remove the altar **cloths** and make off with them. The fire was put out to symbolize the death of Jesus.

Most churches had a sepulcher for use in dramatizing the burial of Jesus. It could be a niche built into the wall, usually to the north but always near the high altar. It could be a wooden frame, hung with curtains, placed in the sanctuary during Easter. Sometimes there was a chest made of stone or wood to represent a tomb. Other times, a curtain was drawn across the niche to close it, or cords were drawn across it to represent its closure. Wealthy donors began to endow tombs that were placed where the Easter sepulcher would be, so their tomb niche could be used. When a church did not have such a niche, the priests placed a chest at the front altar or, at the very least, created a curtained space to its side. In some very old churches, there was a crypt below the altar that was used as the Easter sepulcher.

In the *Depositio* ceremony, a cross, perhaps with a removable carved figure of Jesus, was placed into the sepulcher on Friday night after vespers. No lay people were permitted to attend the ceremony; it was only acted out by the priests and monks. Usually, a host—the bread used for the Mass—was also symbolically buried. Churches with crosses that had a removable corpus often reenacted the burial by washing the wooden figure in water and wine. In some regions, this reenactment could be very elaborate. The wooden corpus could be covered with an expensive pall, carried in a hearse, and buried in a coffin. In Germany, full-sized figures were often used. Some large churches kept a set of wooden figures, decked in clothing and wearing wigs, to set up a tableau of the action.

After the sepulcher was closed, candles were placed around it, and monks and priests began a watch. This was in accordance with **funeral** customs, when the body was kept company over night. The watch continued through Saturday, when lay people could presumably visit the church and see the solemn sight. A new fire was kindled with fire irons on Saturday night. The priest blessed the fire, and people lit candles and lamps to take the flame home.

Early on Sunday morning, while it was dark, a sacristan removed the cross and corpus from the sepulcher, leaving only the host. A procession of priests then came at daybreak, carrying candles, and removed the host. In some rituals, the host was displayed in the procession; in others, it was returned quietly to the altar, and the cross alone was carried. **Bells** pealed, and the lay public joined for the daybreak service. In some places, there were superstitions among the people that if they could sneak in and see this

Elevatio ritual, they would not die that year, but priests were careful to exclude lay people to discourage the folk belief.

The Easter Mass was the high point of the church's year. In some regions, the service may have used joyful **musical** instruments, such as trumpets or bagpipes. Bells rang at many points. The Easter Mass also included dramatizations for the people's benefit. The choir sang and acted the *Visitatio,* the story of the women who found the empty tomb. Monks or nuns, representing the women, went to the sepulcher with incense and found it empty, with only a cloth left behind (in which the cross or corpus had been wrapped). Two monks represented the angels by the empty sepulcher, and they sang the news, "He is risen." In some regional variations, the choir acted out the release of souls from hell by having a sudden procession of monks or nuns come out of a closed room, singing. It was all in Latin, but since the people knew the general story, they could follow the dramatic action.

Easter dinner was one of the major feasts of the year. Having eaten no meat, eggs, or cheese for six weeks, people had saved up plenty of eggs and cheese, and they were ready for a very good meal. Traditional feast **foods** especially included roast lamb or mutton and tansy cake, a sharp, bitter cake whose flavor was enjoyed in the Middle Ages. Many eggs had been hard-boiled during the fasting weeks in order to preserve them. There was a long folk tradition of decorating some of these eggs with vegetable dyes. They were called pace eggs after the Hebrew word *Pesach* for Passover and Greek *Pascha* for Easter. People gave them as gifts, paid performers in colored eggs, tapped them together in greeting, and had egg-rolling games. Easter was also a time for Morris dancing and miracle plays.

On the Monday and Tuesday after Easter, some parts of rural England celebrated Hock, a holiday of doubtful origins. It may have celebrated a victory over the Danes around 1002. On Monday, the women used ropes to capture men and hold them for ransom, sometimes for a kiss and sometimes for pennies. On Tuesday, the men could do the same for the women.

On May Day, there were village festivals and games. The games were of pagan origin, not Christian, and the church disapproved of them for most of the period and in most places. Villagers raised a maypole, sometimes crowned with ram's horns or flower, and chose a summer king and, in later tradition, a May king or a May queen. They sang songs, and in England they played out dramas with a **Robin Hood** theme. Maid Marian appears to have been invented as a character for the May festival so Robin could have a romance, in parallel with the May king and May queen tradition. People set up outdoor banquets and flower arbors. The relaxation of rules of behavior, which permitted young people to go into the woods to find branches and flowers, sometimes led to pregnancies or fights.

Ascension Day was 40 days after Easter, and it marked the ascension of Jesus into heaven. In Venice, it was the main civic holiday. Venice, built on

May Day, a traditional celebration of spring, always involved dances around a tree or a flower-decorated pole. May Day, like Christmas, had its own set of carols and folksongs. Additionally, most parts of Europe had a tradition of folk dramas in which a man was brought back to life. In England, the dramas included both mumming and plays about Robin Hood. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

the islands and lagoons of a sea marsh, was more closely tied to the sea than most cities. On Ascension Day, the main ceremony was the Marriage to the Sea. Venice viewed itself as the husband ruling over the obedient wife, the sea. They kept a special red and **gold** barge in which the doge, the ruler of Venice, was rowed into the harbor, where he dropped a gold ring into the water. The seventh Sunday after Easter was Pentecost, also called Whitsun. It was a three-day feast, and, since it occurred in the early summer, it was a popular season for fairs.

June 24 was the day of Saint John the Baptist. He was the patron saint of Florence, Italy, and this day was the biggest civic festival. Many Florentines planned **weddings** for the day so they could make double use of the feast day. Guilds in the city put up displays to honor their crafts, and all shops closed. On the previous day, the priests led a mass procession of relics, and the citizens came in a procession to the church of San Giovanni and presented gifts of large wax candles. The day itself was celebrated with a display at the piazza, where neighboring cities presented tribute of rich cloth robes. Each robe, called a *palio,* was hung in Saint John's church for a year and then auctioned to raise money. The day was devoted to weddings and feasts and included a ceremonial release of 12 prisoners.

The main event was a horse race through the city streets, held in the later afternoon when the banquets had ended. The prize was a very expensive fur-lined palio, which was hung at the end of the course. The streets marked for the race were decorated with all the banners, carpets, and flowers the citizens could muster. The *palio* of Florence's Saint John's Day race became

a general word in medieval Italian to mean the prize for a civic horse race and then the race itself. Bologna held its palio race on Saint Peter's Day with a bolt of scarlet cloth as the prize. Other Italian towns repeated these customs, with candle processions and horse races, as they could afford.

Midsummer was also a folk festival for most Northern Europeans. It was Saint John's Day, but the summer solstice in the middle of July was the original pagan festival. Pagans had made bonfires of bones and leaped through the flames for luck. As Christians, they still made bonfires, and some threw oak branches and flowers into the fire with folk rhymes based in pagan beliefs. The traditional rhyme in England ran, "Green is gold. Fire is wet. Fortune's told. Dragon's met." In some regions, they floated small fires or candles on water. Mumming plays about Saint George and the dragon were popular.

Saint Swithin's Day in England was also in July, and it had traditions of strewing flowers and making garlands to wear and with which to decorate the church. The weather on Saint Swithin's Day was supposed to predict the coming summer weather. In England, Lammas Day came in August and was a day to celebrate the harvest. Sheep were permitted to graze freely on village lands that were normally fenced off. *Lammas* came from the Old English word for "loaf." On that day, people made loaves of all kinds, from currant buns to fanciful breads with edible flowers.

See also: Calendar, Dance, Drama, Feasts, Robin Hood, Music.

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Hood, Robin

Robin Hood was the most popular English folk hero of the 14th and 15th centuries. His legends were restricted to England, and, although they may

have been sung in courts, they belonged to the common people in a way **King Arthur** did not. Like the Arthurian cycle, stories of Robin Hood were invented by different people in different times and were only united into a single strand during the 15th century. The *Gest of Robyn Hode* connected five existing stories, patching them together as a complete story that ended with the hero's death. There are at least three other contemporary 15th-century stories, as well as later stories composed in the 16th century. But Robin Hood seems well established as a folk hero of ballads long before. The 14th-century poem "Piers Plowman" criticized priests who knew the stories of Robin Hood better than their prayers, and there are scattered references to May plays about Robin.

Historians have tried to identify an original Robin Hood, but it is most likely that his name was something like the modern generic name John Doe and that his literary character has a reality similar to Batman's. Earliest references to Robin place him in the 13th century, a time when hoods were a universal **hat** fashion. There were other outlaws in stories, chiefly Adam Bell, Clim of the Clough, William of Cloudesly, and Gamelyn. Their stories are very similar to Robin's. All take refuge in the **forest,** all are guilty of poaching deer, all get drawn out of hiding by treachery and must use their wits and their weapons to regain safety, and all find ultimate justice with the king, not with his officers. That Robin Hood's stories gained dominance may be an accident of his name working best in rhyme and song.

The context for Robin and the other outlaws is the restrictive forest laws laid down by King William I and his descendants. These laws were at the peak during the reign of Henry II in the 12th century. Henry II's sons appropriated more forest lands. King John, the villain of the modern Robin Hood legends, was only following the precedents of his father and older brother Richard I in adding to his forest preserves. His son, Henry III, was required to promise to uphold the Magna Carta provisions that King John had signed unwillingly; from then on, the royal forests began to shrink, and poaching was a less serious offense. Other aristocrats began to keep forests and parks, though, and they hired foresters and parkers to police them.

The Robin Hood ballads show familiarity with **hunting** practices and terminology. The stories accurately differentiate between the types of deer in medieval English forests and use clever references to hunting customs. Robin often met his men under a designated tree—the trystel, or trysting, tree. In bow hunting, when the deer were driven toward the hidden royal hunters, the place where they hid was the tryst. Robin and his men were not aristocratic hunters with dogs. They used the bow, the weapon of the common folk. By the 15th century, landowners were more concerned with woodcutting and unauthorized grazing than with poaching. Poaching still occurred, but it was infrequently prosecuted, and the punishments were not worse than fines. Some records show a fair number of respectable

The cast of Robin Hood's tales grew until the stories reached a sophisticated form in the 19th-century version by Howard Pyle. Fashions and customs of the 14th century were enshrined in Robin's stories so that many modern readers and moviegoers associate hoods, short coats, and hose only with Robin Hood. (Howard Pyle, *The Merry Adventures of Robin Hood*, 1890)

citizens venturing into the forest to bring home a hart or buck, probably with bows as Robin and his men did.

The Robin Hood of later stories, depicted in modern film versions, is a dispossessed nobleman living in the time of King Richard I and Prince John. The medieval Robin is a yeoman of the 15th century with stories that include King Edward, not King Richard. King Edward I was a popular king known for relatively good governance, and his reign was in the late 13th century. The forest laws did not press on people as much then, and travel and trade were expanding. The Robin Hood stories are more comfortably set in the reigns of the kings Edward I, II, or III than in the time of King Richard I.

Although the Robin Hood stories about the 13th century were written down only 200 years later, there is already some anachronism. The term *yeoman* was not common in the 13th century, but it was widely in use by the

15th. It was in such wide use that it is not clear what a yeoman really was. Yeomen were small but independent farmers, and they were also middle-ranked servants of the king. In the context of the forest laws, a yeoman could be any sort of royal official guarding the deer and trees. The word may have had such wide use because the old terms didn't fit as societal structure shifted. Yeoman may have indicated a general middle-class position. The medieval Robin Hood was not a nobleman; he was a middle-class Everyman.

The sheriff, Robin's main adversary, was a more important figure in the 13th century than in the 15th. Sheriffs were appointed officials who administered justice in the king's name for a term of one year. Local landowners, the small nobility and knights, took turns as sheriff. They collected some taxes, held inquests, and presided over courts, while also being responsible for making arrests and holding men for trial. In the 12th century, sheriffs had been appointed directly by kings and had power unchecked by the people; their appointment from among the local landowners kept them responsive to the community. Even with decreased power, they oversaw enough facets of local government to tempt them to use their term for corrupt gain. They could sell jobs like "under sheriff" for high fees, and many took bribes. Sheriffs were not popular among the common people, and a legendary Sheriff of Nottingham made a good target for comic stories.

Robin Hood also frequently found himself up against wealthy monks. The stories make it clear that Robin himself was very devout, probably more than the greedy monks. By the 15th century, half of England's land was owned by the Catholic **Church,** often by **monasteries.** While some monks were still devoted to the care of the poor and to prayer, many had become businessmen who managed farms and mines and collected rent from tenants. They were not responsible to civil law, and the people resented their greed in the name of religion. When Robin Hood robbed a rich abbot, his audience could only cheer.

Robin's band grew as the stories expanded. Friar Tuck was a late addition, but Little John was already his lieutenant in 14th-century references. Much the Miller's Son and Will Scarlet are two other early names in the band, which mostly remain anonymous. Robin's lady, Marian, was the last addition. In the *Gest of Robyn Hode,* there is no Marian. Robin's devotion is for the Virgin Mary, and he is as single and chaste as a monk. Marian seems to have been added in folk **dramas** about Robin Hood that were acted in villages and towns for May Day. Robin and forest freedom were celebrated on this spring day, but so were pretty girls with garlands. May Day plays were very often about Robin, and they needed a pretty girl, Marian. After the Reformation brought an end to the public cult of the Virgin Mary, Robin's stories may have been edited to place a real woman, Marian, in the spotlight instead.

The medieval Robin Hood did not rob the rich and give to the poor. He robbed rich travelers, especially if they were corrupt. He always invited them to dine, first, in his role as king of Sherwood Forest. Travelers were asked to pay for their dinners, which was the robbery. In the legends, an honorable man who could not pay was not further harassed. Robin helped a poor **knight** with a loan, but he wanted it repaid. The charitable Robin who gave to poor peasants was a later invention.

See also: Drama, Forests, Holidays, Hunting, Monasteries.

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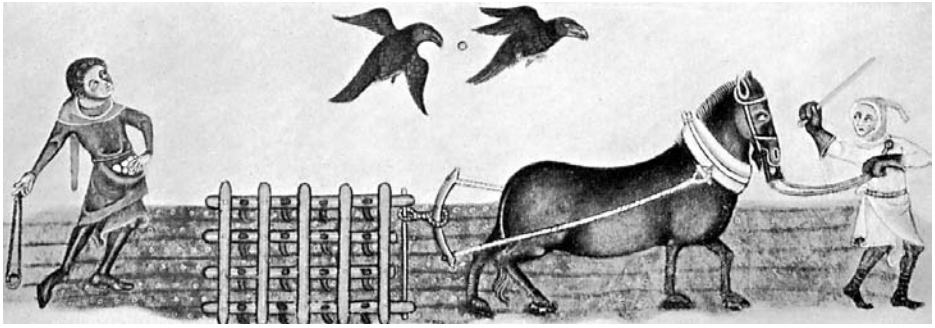
Horses

With the fall of the Roman Empire, the horse as a war animal lost its importance for a few centuries. Invasions of mounted Arabs, Huns, and Turks pressed Europeans to learn cavalry warfare. With horses came the most familiar figure of the Middle Ages: the **knight.** At the same time, improvements in peacetime horse care made all kinds of horses more important to the economy.

Europe had herds of ponies and small horses when it was part of the Roman Empire. Cold regions had smaller ponies with thicker hair. Cool, wet regions tended to raise horses with larger bones and heavy muscle. Hot, dry regions favored horses with thin, dense bones; light bodies; and short hair. These ponies carried packs and, in some places, drew two-wheeled **carts.**

Horses are different from ponies in more than size alone. Even small horses, brought into Europe from North Africa and Asia, were able to breed larger horses when their diet improved. The average horse in medieval Europe would be considered small today. (Horses are measured to the top of a shoulder, called the withers. One hand equals four inches.) A typical modern horse is about 15 hands high, while a modern pony is typically between 12 and 13 hands. Most medieval horses were more nearly pony sized. Their "great horse" for war was the size of an average modern horse.

Providing horses for war and civil use was a constant endeavor. A mare can produce no more than one foal per year, and often less. There was growing demand for horses as both warfare and **agriculture** in Europe came to depend on them. The old methods of keeping a herd of horses to breed undirected were not good enough, and, by the close of the Middle Ages, Europe had many aggressive breeding programs and an international market.



The horse's earliest farm use was in pulling lighter equipment such as the harrow. In this 14th-century pictures, a horse-drawn harrow is covering the seeds as the sower casts them out with his hand. The farmers carry sticks to chase away large, aggressive crows. The horse's harness is very simple: the harrow is tied to ropes on the horse's collar. As harnessing grew more sophisticated, horse teams could pull heavy plows and wagons. (The Print Collector/StockphotoPro)

Horses in War

Byzantine troops depended heavily on mounted archers, who also carried spears and a sword. They could use lassos, as could other Eastern cavalrymen, and they occasionally used them as weapons. Byzantine cavalrymen fought in a unit and were trained to stay together in ranks. They were a fighting unit, not individual knights.

The western Germanic tribes—the Franks and Anglo-Saxons—had no tradition of fighting on horseback. The eastern Ostrogoths, Visigoths, Vandals, and Lombards did, but they did not combine cavalry with bows. Avars, Turks, Mongols, and Magyars, invaders from Asia, all rode small horses and were able to shoot arrows on horseback.

The first **Muslim** armies were cavalry and rode both camels and horses. Some did not use saddles, and they did not adopt stirrups at first. By the ninth century, after taking over Byzantine and Persian territories, they were using both wooden and **iron** stirrups. They fought with bows, but also with long spears. Arab horses were famous for their small size and great speed. The Arabs called them Faras and kept their breeding separate from the Barb horses of North Africa. The Muslim conquest of Spain was mostly carried out by North African Berbers commanded by Arab generals. They brought their Barb horses and also used the existing strains of horses in Spain, now called the Andalusian breed. They were larger than true Arab horses. Muslim emirs and caliphs in Spain used selective breeding to blend Spanish and North African horses.

After Charles Martel's heavy infantry defeated Arab cavalry at the Battle of Poitiers, the Franks began to use mounted warriors. The Avars, invading from the East, were defeated in 976, and the Franks adopted their use of

stirrups. They did not develop methods of horseback archery and instead trained to charge with lances and fight with swords on horseback. Their horses may have been mostly purchased from Spain, since later Charlemagne sent "Spanish" horses to the caliph of Baghdad as a gift.

The Franks also learned to hunt on horseback. Charlemagne spent many hours on horses every day, both **hunting** and training for war. He required horses as part of the taxation of his nobles; his royal farms carried out breeding programs. Each stallion had a small herd of mares, but they were rotated out to other herds to prevent inbreeding. Inferior horses spread into civil society as riding horses and packhorses. Unlike later Christian Europeans, the Franks had no taboo against eating old horses.

More horse-based invaders came into Europe. Magyars from Hungary and Mongols from central Asia both used mounted warriors exclusively. They traveled in horse-drawn **wagons** and lived in tents. Their ponies foraged on grass and did not need extra provisions, so both the Magyars and the Mongols could travel faster than Frankish armies. Their ponies knew how to dig for grass under the snow, while European horses did not. However, their style of horse warfare was better suited to the flat grasslands of central Asia. Western Europe was **forested** and did not have as much foraging pasturage. Even without military defeat, their onrush was slowed because their horses could not graze as they were used to once they left Asia.

Henry of Saxony became king of Germany in 919, during the invasions of the Magyars. He built walled towns and trained a cavalry force that was able to stop the invasion. The Magyars settled down as horse-breeders in Hungary. The new Christian kingdom of Hungary continued to use light cavalry with mounted archers, although they also adopted Western Europe's technology of heavy mounted knights. Hungary's horse ways were no longer distinctively Asian.

During the 10th and 11th centuries, some Norman knights traveled to Spain and fought against the Muslim armies as part of the Christian effort to reconquer the peninsula. Some brought back Spanish stallions and used them to improve Norman horses. By the 11th century, Normans were expert cavalry warriors. When the Normans invaded Anglo-Saxon England in 1066, they transported about 2,000 horses in open **boats** across the English Channel. The Anglo-Saxons had horses, but they only used them for travel. They fought on foot, using a shield wall. At first, they were able to withstand the Norman cavalry charge, but their shield wall broke after several charges and retreats, and the Norman mounted soldiers ran them down. From that time, mounted warfare was dominant in Europe until the era of **gunpowder.**

The chief use for heavy warhorses was the chevauchée, a mass charge by many knights in a line. Saddles for this tactic had rigid walls and essentially locked the knight onto the horse's back. The knight held a lance tucked

under his arm, reaching well in front of the horse. He could also fight with his sword on horseback, but his lance was his primary **weapon.** The horse was trained to charge into danger and to stop and turn quickly.

During the 12th century, selective breeding by kings and other wealthy lords sought to create the best kind of warhorse. While size was an object, overall strength mattered more. Once knights had been trained and armed for horseback fighting, they were dependent on their mounts. If the horses tired or could not carry them, they were more likely to be killed out from under them, and a knight without a horse was not an effective fighter. A knight whose leg was trapped by a fallen horse had to surrender.

In spite of selective breeding for size, knights' horses were not large until the 14th century. Most warhorses whose skeletons have been examined were not taller than 14 or 15 hands. Modern racehorses are usually taller than 15 hands, and modern draft horses are about 18 hands tall. A typical 14th-century knight stood shoulder to shoulder with his horse.

However, by the late Middle Ages, there was a distinctive type of horse—the destrier, or "great horse"—for jousting. These horses were not large by modern standards, but they were heavy and tall by medieval measure. They were 15 or 16 hands, and they were heavily muscled so that they could carry a great deal of weight for their size. Horses were expected to carry not only their rider and his **armor,** but also their own armor. First it was thick leather padding for the horse's chest and head, and then steel plates. The armor and the padded drapery, decorated with heraldic designs, were called a caparison. The increase in padded horse armor then drove spurs to greater size, since a horse protected from lances was also protected from his own rider's spurs.

Knights rode on palfreys or coursers to travel and had their destriers led to spare their strength. Coursers were faster than warhorses, and they could be mares or gelded horses. Destriers were always stallions, and they were fiery in temper and fantastically expensive compared to lesser horses. A warhorse could cost more than a year's income, but the horse for a **servant,** or for an archer to ride on to move about from battle to battle, might cost less than a tenth of a warhorse.

The **Crusaders** were heavily dependent on horses, both for travel and for fighting. They shipped the horses in special transport **ships** that could carry between 30 and 100 horses. The ship voyage across the Mediterranean, which lasted more than two months, had to be broken into stages so the horses could get fresh air and exercise on islands. Once in Palestine, the horses had to be brought back to full strength after so much inactivity. When they were injured or died in battle, it was difficult for the knights to replace them, and some knights had to ride mules.

Crusading orders of knights like the Templars kept large stables of horses, with all the supplies needed: farriers, harness makers, grooms, and large

supplies of hay and water. In addition to their destriers, Templars needed palfreys to ride while traveling and rounceys for the servants or squires who led the warhorses. All war undertakings required workhorses to carry equipment and supplies. Crusaders were in constant need of buying replacement horses in order to remain effective in hostile territory. They began to use Arabian horses and mules more than the heavy Norman horses they had brought with them. Food and water shortages killed many horses during campaigns and sieges. It was a prolonged struggle to maintain a Northern European war style in the Holy Land.

Horses in Peacetime

In the early Middle Ages, oxen were the main draft animals. In the wilder places to the North, small shaggy ponies carried packs. Riding horses were expensive, but wealthy men used them. Horses were seldom used to pull carts or plows. The most normal peacetime use for horses seems to have been as pack animals.

Horses could not be used in farming until two problems had been solved. Their hooves were smaller and more easily damaged than an ox's, and the ox yoke could not easily be applied to the horse. The horse harness of the late Roman Empire and early Middle Ages used a strap around the horse's chest, connected to a girth around its belly, to pull a load. But this chest strap cut off the horse's blood and air supply so that the horse could not use his full strength.

The padded horse collar, first invented in China and brought by stages across Asia to the Mediterranean, solved the problem of a horse's load-pulling ability. It was rigid and padded; it fit in front of the horse's shoulders, leaving the chest and windpipe free of pressure. The harness attached the load to this collar so that the horse could lean his full weight against it. Some medieval records suggest horses may have been able to pull 10 times as much with the new harness. Horse collars were widely used around the time of Charlemagne. The nailed horseshoe also appeared in Europe around the ninth century. Horses with shoes could plow better in soft ground, and their hooves did not split as easily.

The new technologies of horseshoes and the horse collar made horses much better farm animals. The use of horses increased dramatically during the reign of Charlemagne and his sons. Farmers began to raise oats as a third crop, and they were used mostly to feed the horses. Horses became more common on Northern European farms, but they were small, often sickly animals. Peasant farm horses had problems with diseases like colic and worms. They developed arthritis or got weak ankles.

In the Mediterranean regions, oxen remained the dominant plow animal, although some horses were used. Donkeys were more useful for pack

use and carts. Donkeys were used in Northern Europe, but they were much less common. All these animals were used in all regions, but horses became dominant only in the North.

Horses became more important on farms when towns grew and farmers needed to carry food to market in carts. Horses had been used as pack animals before, but carts and wagons could carry much more. A packhorse could not carry more than 400 pounds, but, with a cart, the same horse could transport a ton of hay. Horse breeding and care became more important, and horse markets grew. Horses were bred for size, and, over the last centuries of the Middle Ages, the average horse size grew by one or two hands.

Large international horse markets were held in cities like Antwerp, Cologne, and Genoa. Large horse breeders sent agents into North Africa to buy Arabian horses and combed Europe for the best stock. Horses from the various regions across Europe were considered different breeds. The most prized horses in Northern Europe came from Spain and were often called Castilian horses. They were part North African Barb and perhaps part Arabian. They were among the tallest horses. Arabian horses in the Middle East and parts of Spain were small but very swift, had thin, elegant heads and legs, and were valued for breeding. Hungarian and Danish horses were smaller but were considered very strong, and Hungarian horses often had slit nostrils to help them breathe better while running. Horses bred in Normandy were heavily muscled. Horses from southern Italy were light boned and made good palfreys for riding but not destriers; northern Italian horses were larger.

In the 12th century, London's Smithfield **Fair** became known for weekly horse sales that continued into the 19th century. Medieval horses were generally divided into the uses they were trained for. A visitor to the Smithfield Fair described seeing tall palfreys, warhorses, rounceys for general riding, plow horses (also called affers), and pack horses (also called sumpter horses). Some pack horses were mules, since donkeys were even more plentiful than horses during the Middle Ages.

Palfreys were somewhat smaller than destriers but were nearly as expensive and carefully bred. They were supposed to have quiet temperaments, unlike the destriers. Palfreys were used for hunting, ceremonial parades, and general travel among the aristocracy. Rounceys were grouped by the gait they were trained to use. The gallopers were called coursers and were ridden by men at arms and messengers. Some rounceys were trained to trot and were used by gentlemen as their main riding horse. Amblers were trained to walk with a simple rocking gait by moving their same-side legs at the same time. Both left legs, then both right legs, moved in tandem. This gait is not natural to horses. Amblers were the lady's choice of a riding horse; Chaucer's Wife of Bath rode an ambler. Amblers were slow moving,

and they were bred and chosen for their easy-going natures. People who were inexperienced riders always hired amblers for journeys. Jennets were smaller horses for aristocratic ladies. They were probably more Arabian in breeding, since they came out of Spain. In Spain, jennets were used as war-horses.

In towns, few people owned horses. Towns were small, and most people could do their business on foot. Horses were for long journeys and had to be rented. On these journeys, horses ate a special type of bread baked for them, made of beans and peas, along with the ordinary hay. Businessmen who rented horses for a living were called, in medieval English, hackney-men. The daily hire for a horse might equal the day wages of a skilled laborer, so hackneymen were certainly able to make a good living. On routes with high traffic, such as London to Dover, hackney horses were often branded to discourage theft. Chaucer's Tabard **Inn,** where his company of pilgrims met to start for Canterbury, was one place to rent horses. These horses made the journey to and from Canterbury repeatedly.

Medieval people raced horses, although, in most times and places, the game was restricted to those who could afford horses: the aristocracy. In Italy, however, the cities organized horse races to celebrate the **holidays** of their patron **saints.** By the 14th century, the races, called *palios* after the traditional prize of a costly palio robe, were well organized and traditional. Boys, sometimes dressed in the livery of the **guild** that employed them, were the jockeys, and the races were often run in the city square, rather than in a field outside the city.

By the 15th century, horses were bred and trained for riding nearly as often as for harness. In this drawing, the horse appears to have black iron shoes, in addition to a full harness holding the saddle securely. Proportions in medieval illustrations are not very accurate; the human rider (here, Chaucer's Wife of Bath) may not have been quite this large in comparison to her mount. However, medieval horses were generally smaller than modern horses. A lady's riding horse may not have been much bigger than a modern Welsh pony. (John Saunders, *Canterbury Tales: Annotated and Accented with Illustrations*, 1894)

The Muslim warriors of Persia invented the game of polo during the Middle Ages. Polo was their war training game, as jousting at **tournaments** was battle training for Northern European knights. Polo required the horses and riders to be trained to work together and to make quick turns and sudden stops.

Horse Equipment

One of the key inventions of the Carolingian era was the iron horseshoe. This piece of equipment permitted horses to work harder and run farther without wear on their hooves. In the damp climates of England and France, horses' hooves were softer and wore out more quickly than in the dry climates of Spain and North Africa. Although nailed-on horseshoes caused their own problems, their benefits outweighed the disadvantages. Medieval horses were almost universally shod. Horseshoe nails were hand hammered and square. The holes in a medieval horseshoe were also square. A typical shoe had eight holes.

Farriers were also called marshals in medieval English, and the household division overseen by the marshal was a marshalsea. The marshal of a noble household oversaw the care of all the horses, including the hire or maintenance of wagons and carts. He supervised the grooms and stable boys. Although marshals began as horseshoe specialists, they also became the horse veterinarians of the time.

For shoeing, horses were put into a wooden frame called a travis, or *travail* in medieval French. The frame was only somewhat larger than a horse's body, so it hampered the horse from moving. His head stuck out of the frame so the owner or another handler could hold it; at the back, there was a bar to rest or even tie the foot being shod. The travis was normally open but could have a roof over it. It was used not only for shoeing, but also for other veterinary work.

Medieval bridles were very similar to modern ones. A leather harness went over the horse's ears and down the face to the jaw. Here it attached to a metal bit that went over the horse's tongue. The reins held by the rider seem to have been a pair of single straps, rather than a continuous *U*-shaped strap. Since horses were luxury goods themselves, their equipment was often decorated. A horse's bridle often had decorative bosses attaching the straps. The straps themselves often had diamonds, rosettes, or other heraldic emblems attached to the leather.

By the late Middle Ages, bits and stirrups were made by specialized blacksmiths called loriners (or lorimers). The bits were made of **iron,** bronze, or **copper.** There are two basic modern types of bit, and both were used in the Middle Ages. The snaffle bit is a bar, solid or hinged, that attaches to the bridle with rings. The curb bit attaches the mouthpiece bar to a set of

levers, and the bridle connects to the bottom of the lever that hangs below the horse's jaw. When the rider pulls on a snaffle bit, the horse's mouth feels only the direct pull, but a curb bit provides the rider with greater pressure from the levers. Curb bits were more popular on medieval bridles after the 13th century.

The medieval saddle was similar to a modern saddle. It was made of a wooden frame that was stuffed and covered with leather. Arab saddles were lightweight and had short stirrup straps, but the European saddle developed into a heavier seat. The knight's saddle was particularly specialized. It had a tall pommel in front, which widened into a protective piece called a burr-plate. The saddle provided an extra wall for the rider's crotch and upper legs. The saddle had a high cantle at the back, which boxed in the knight's armor and helped keep him steadily seated. The saddle's framework, the saddletree, was made of beechwood. Two pieces of wood rested on each side of the horse's backbone and joined in the middle, held by the burr-plate in front and the cantle in back. Leather and sheepskin padding filled out the seat, which rested several inches above the horse's back.

The knight's saddle had an elaborate harness. While a modern saddle is held only by the girth strap, the medieval saddle also had a breast strap and a strap that ran around the horse's rump called the crupper. These straps were necessary to help the knight withstand the shock of battle lest his saddle slide out of position. However, they also became opportunities for display. Many illustrations show riders with pendants hanging off these saddle harness straps. Popular pendant shapes were crosses, shields with coats of arms, and geometric shapes or flowers.

In addition to the breast strap and crupper, the saddle had leather straps to hold the stirrups. The stirrup straps were a key part of the saddle; knights stood in them and leaned their whole weight against them in jousting. Because knights needed to stand, the stirrup straps were longer than modern ones; knights did not ride with bent knees. Stirrups made by loriners came in various shapes. One jousting style tapered toward the toe so the knight's foot could not slip forward. If he fell, he needed to fall cleanly and not have a foot hung up in a stirrup.

An important piece of horse equipment was a pair of spurs for the rider. Spurs became a symbol of knighthood, especially if they were golden. Spur making was its own craft, represented by the guild of the spurriers. Ordinary spurs were iron or brass. Spurs came in two basic shapes. The prick spur was the earliest kind, but, during the 13th century, the rowel spur came into use. The rowel spur had a wheel with many spikes on it, but, in many cases, the spikes were more rounded than sharp. Long spikes were used mainly by knights whose horses wore quilted padding. Like other pieces of equipment, spurs could be highly decorated—perhaps more so since they were worn by the rider, not by the horse.

Warhorses began wearing their own armor during the 12th century. Fabric armor was called caparison; it was quilted and could only protect a horse from accidental, glancing blows and scratches. Chain mail was the next step, placed over the caparison. By the end of the Middle Ages, the largest horses of the wealthiest knights were wearing steel armor on chest, head, neck, and even body.

Excavations have uncovered currycombs that are very similar to modern ones. The combs have a broad blade with saw teeth and a handle attached. The horse's hair is cleaned by combing the teeth gently across the horse's body, removing loose hair and dirt.

See also: Agriculture, Armor, Knights, Tournaments.

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Hospitals

In medieval Europe, the first official hospital care came with the establishment of Benedictine monasteries. Hospitals cared for the old, perhaps the largest category of sick people. They also cared for those born crippled, or who had become crippled or paralyzed in accidents, and for the blind or retarded. People with serious epilepsy, known as "the falling sickness," found a home in some hospitals. Contagious illnesses were not among the concerns of most hospitals, since they were dangerous for the staff. Leprosy was handled separately through dedicated leper hospitals and colonies.

The Roman army had included hospital care for their sick and wounded when planning forts. These hospitals were the first in Northern Europe,

but their closure with the Roman army's withdrawal meant that the hospital had to be developed again separately. There were Roman-style hospitals in Constantinople as early as the sixth century. In a Byzantine hospital, patients could recover from an infection or have a simple surgical operation. The Byzantine model became known in Europe after the Crusades, and it helped reorganize the kinds of hospital care already available.

General Hospitals

The Rule of Saint Benedict required **monasteries** to set aside a few rooms for the care of the sick and an officer to look after them. The sick were to have a good diet and regular baths. The poor, too, were to receive help if they asked, and their sick could petition for care. By the late Middle Ages, a monastic infirmary offered the best possible care for the sick, who not only enjoyed warm rooms and meat every day, but also might listen to harp **music** to cheer their spirits.

In Latin, a medical hospital was called *domus dei,* a house of God. The term *hospital* originally meant a place to care for travelers, like the modern word *hostel*. The Order of the Hospital was an order of **knights** sworn to protect travelers in the Holy Land. The word *hospitium* in Latin became *hospitale*; for a time in medieval English, the word for a house for the sick was simply *spital*.

Constantinople had hospitals supported by the state, and early medieval Italy also developed simple hospitals for the sick. There are few records of hospitals in Northern Europe until the 11th century, although their subsequent rapid development in England suggests there were more hospitals in France and Germany.

Lanfranc, the first Norman archbishop of Canterbury after the Norman conquest of England, set up a building outside the town gates for the care of the sick. It had a men's wing and a women's wing, with funding for a care staff. In a separate location, he established a leper colony. Lepers and other invalids were not cared for together, since leprosy was known to be contagious, while other diseases were not. In the first century of Norman rule, at least 60 more hospitals were established. Some were leper colonies, but many were not. Most grew up near highways where many travelers passed, and the earliest ones were built, like Lanfranc's, outside the town walls on an empty lot.

During the Middle Ages, religious orders were founded specifically to care for the sick and poor. The Order of the Hospital spread from the Holy Land into the rest of Europe, eventually reaching England in 1128. They operated hospitals for the sick in some parts of Europe, supported by income from estates donated by the pious. The Hospitallers based their model of operation on the Byzantine model they came into contact with in

Jerusalem. Their primary hospital, in Jerusalem, may have had as many as 1,000 beds for patients.

The Order of Saint Lazarus of Jerusalem was a religious order dedicated to the care of lepers. Its houses spread across Europe. Other religious orders for the care of the sick included the relatively small Order of Saint Thomas the Martyr of Acon, an English order that failed in its intention to found hospitals around Europe but did administer one large London hospital. Saint Mary of Bethlehem was another order founded in the Holy Land; it founded first a priory and then a hospital in the 14th century. Its ordinances permitted it to accept the mentally ill, and later that became its main mission; Saint Mary of Bethlehem was shortened to "Bedlam," the name of London's mental hospital. A Provençal monk founded the French Trinitarian Order, which administered hospitals and almshouses across Europe.

Most **city** hospitals were under the control of the local bishop, and the **church** normally provided funding and staffing. Individuals were encouraged to give charitably to hospitals, and some of the wealthiest, usually royalty, founded hospitals. But most hospitals are hard to distinguish, in **records,** from the religious houses they were part of; they were also hard to distinguish from almshouses that cared for the poor, rather than the sick. The Hôtel-Dieu in Paris was an early medieval **inn** and hospital for the poor and pilgrims; it fulfilled both functions. Paris also had a hospital for the blind, as well as leper hospitals (*leprosaria*).

Charitable societies in late medieval Italy set up hospitals in many cities. Milan had 10 hospitals, and Florence had at least 30. The charitable societies and commune governments kept surgeons on their payrolls, and guilds helped inspect the hospitals. These hospitals cared for all kinds of poor and sick, including orphans and the aged. The development of medical schools in Italian cities such as Padua, Salerno, and Bologna raised the level of medical care. French and English hospitals lagged behind and continued to give mostly food and rest.

Hospitals had a prime function of looking after the spiritual welfare of their patients, not their medical care. Priests and chapels came before **medicine** in priorities of time and money. Since the staff members were mostly monks and nuns, they had already made vows to keep the hours of prayer and say Mass every day. The inmates of hospitals, where able, participated in this rigorous life of prayer. The next development was for hospitals to develop small choir **schools** so they could help the children of the poor while providing a choir for the Mass.

Hospitals gave medical care, but some restricted the type of care they would give. Many excluded lepers, but some also excluded pregnant **women,** epileptics, and the insane. Each hospital's ordinances declared what its conditions were. Some hospitals were closer to almshouses or nursing homes, while others took any sick people and did not limit the time of stay. **Guilds**

The Hôtel-Dieu in Paris was one of the first real hospitals. This engraving shows a typical ward in the 16th century; little had changed since medieval times. Patients shared beds, since beds were scarce and contagion not well understood. The sisters, in sober uniforms, bring the sick basic care such as food and water. They have the added task of preparing the dead for paupers' burials. The large hall appears to be a medieval hall converted to a sick ward; this was often how hospitals began. (Paul Lacroix, *Science and Literature in the Middle Ages*, 1878)

established hospitals and almshouses for their own members or for members of similar trades. Depending on the type of patients a hospital took in, there may have been work programs. Poor or blind women could still spin, and, depending on their disabilities, some others could do chores. Long-term hospital inmates often wore uniforms, robes of a certain color, or the same insignia badge as the staff.

Some hospital ordinances required the hospital to take in pregnant women; these women were probably homeless or very poor, and many were **servants** or prostitutes. In some communities, hospital services had to be established just for this need. The legendary lord mayor of London, Richard Whittington, established a small hospital for unwed mothers in the early 15th century. Some hospitals took in foundlings (abandoned **babies**) and orphans and would care for them to the age of seven.

Hospitals needed funding sources and, like modern charities, were constantly seeking money to maintain and expand services. Some hospitals were granted toll rights for ports or ferries and reaped a sales tax on things like casks of wine. They actively solicited support from tradesmen and

landowners for charitable gifts of money and **food;** some guilds gave ale or meat. Other sources of support were people who paid the hospital an annual fee in order to be received into a room in old age. Like other branches of the church, hospitals could sell indulgences that procured forgiveness for loved ones in purgatory. Wealthy dying people wrote hospitals into their wills as expressions of repentance and in hope of excuse from purgatory. Hospitals were exempted from taxation by the church or king.

When people donated buildings to establish hospitals, the buildings had to be adapted. One common adaptation was to construct individual rooms down the length of a hall, leaving the center fire pit and a common area open. The pillars that supported the roof provided a natural spacing for the divisions. At the end, where the lord's dais had been, another partition could form a small chapel.

In the days before medical technology, a medieval hospital's greatest investment in equipment was in purchasing beds for the patients. Beds typically had straw mattresses held by a rope foundation on a wooden platform and were large enough to fit at least two patients. The beds were not as fine as four-poster curtained beds in a wealthy home, but they were much better than what the poor were used to. When wealthy people were dying, sometimes they willed their bed to the nearest hospital as a charitable donation.

Medieval English hospitals were usually fairly small, and they were always named for patron **saints** whose help was sought for the sick. They were required to have a chapel and their own cemetery for the burial of sick paupers. The largest hospitals could have over 100 beds and about 25 staff members—a mix of monks, nuns, and servants. All through the Middle Ages, hospitals employed more women than men. Most were not nuns, but were lay sisters or hired servants. By the end of the period, many hospitals had a special badge for staff to wear. Most often, it was a cross. The administrator, the master, wore a different colored robe or badge.

Saint Leonard's Hospital in York was the largest medieval English hospital; it was a true hospital for the sick. It had around 200 beds, and its nuns and monks included those with medical training gained by practical learning, though not university medical training. It kept 18 orphans, at least until the hospital was overwhelmed by the Black Death **plague.** Local apothecaries supplied the hospital with spices for common medicines, and most likely they kept an herb garden to grow medicinal plants. However, the sick still received mostly ordinary care such as food, washing, and a heated room to sleep in. The sickest patients were fed in their beds, and the blind or crippled were helped to move about. This may have been enough to help some of the sick recover. For others, it provided some comfort before death. In a most unusual touch, Saint Leonard's hung lanterns in the wards at night. Only hospitals kept **lights** burning in the dark.

European hospitals came under great financial stress when the Black Death struck. A lot of wealth was lost when so many people died and businesses collapsed, and some hospitals saw most of their staff wiped out by plague. In many cases, small hospitals continued to exist in name, owning the assets they had before, but there were few or no patients. The surviving staff often used the hospital's financial support to keep its schedule of prayers and Masses. Sometimes, several small hospitals combined, and, in cases where the Crown had been supporting a hospital, it deeded the hospital to the town. The town could decide how to manage it or whether to close it. Hospitals in Italian towns began to specialize and became orphanages or medical hospitals, rather than both. Orphans and foundlings were a pressing concern with so many mass deaths.

Hospitals became targets for mismanagement and embezzling even before the crisis of the plague. In 1311, the Pope decreed that all hospitals must be audited to make sure the foundation money was not being siphoned off for use by a few. In church and town investigations, some hospitals were found to have roofs collapsing and either inadequate care or no care at all for their inmates. Milan lost some of its hospitals, and Florence's largest hospital was found to be holding fraudulent government bonds. A wave of hospital reform came at the end of the 14th century, with the earliest signs of the coming Reformation. New foundations were established, for the most part smaller and more limited than the earlier ones. More almshouses (old-age homes for the poor) were founded than hospitals for the sick.

Care of Lepers

Lepers lived in separate colonies, apart from the populace. Although the word *leprosy* dates into antiquity, another term for a leper colony or house in medieval English was *Lazar-cote* or *Lazar-house*. These were not hospitals, although they provided hospice care to the dying. There was no treatment for leprosy, but some lepers lived reasonably independent lives for many years, so they were more like isolated villages. These colonies were self-governing, and some lepers had children. Provisions were not as careful as at hospitals, since lepers were permitted to beg or **garden.** Leper colonies, or isolated houses for individual lepers, had to have their own **water** supply and **utensils.** Lepers had to wear boots and gloves if they went out.

Most cities also established real hospitals for lepers. Only the sickest were admitted, and it was a privilege, not apparently a public-health measure. A leper hospital was similar to a monastery in both dress and daily routine. The lepers were required to spend long hours at prayer, repeating the Lord's Prayer many times a day. When one of their number died, they made additional prayers for the departed's soul. Lepers who were committed to

the hospital and not permitted to leave could be punished for fighting by withholding food.

Lepers often went through a formal legal death before admission to the hospital or colony. Under the shelter of a black cloth, the leper gave his last confession and heard Mass, and the priest cast a handful of dirt on him, as if burying him. The leper left with the black cloth as a shroud. In the hospital, he made out a last will, leaving a substantial portion of his property to the hospital.

The provisions at leper colonies and hospitals were generally poor. In both colonies and hospitals, lepers were not only permitted but were expected to beg for alms. It was their way of supporting the hospital. Some leper hospitals had gardens, and the patients had to work to help feed the community.

Leper hospitals were like monasteries to the extent that if a man and wife both had leprosy and were admitted, they would live apart in the men's and women's houses, supervised by monks and nuns. A man could only enter a leper hospital if his wife entered a convent or was too old to remarry. At first, the church had permitted leprosy as grounds for divorce, but, by the 12th century, the Pope enjoined spouses of lepers to care for them.

A wall painting shows a charitable leper hospital with begging lepers in front. They wear paupers' dress, a somber black uniform. One has lost a limb to leprosy and must use crutches; the other carries a noisemaker to alert healthy citizens to their presence. Leprosy was a humiliating disease; lepers had to beg in order to help with hospital expenses, but they had to wear gloves and stay far away from healthy people. (Paul Lacroix, *Science and Literature in the Middle Ages*, 1878)

Leprosy cases declined after the Black Death of 1347–1350. The plague may have killed off enough lepers that the infection became less common. The bacteria may have mutated into another illness; many cases of leprosy were really some other skin ailment to begin with. Leper hospitals had vacancies and began closing in the 16th century.

See also: Beggars, Gardens, Hygiene, Medicine, Monasteries.

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Houses

Medieval houses were small, crowded, dark, and cold compared to modern houses. Houses were limited in size by the basic building unit, the tree trunk. When ceilings and walls had to be based on a length of wood, they could not exceed 15 or 16 feet at a stretch. The simplest house's dimensions were the same as the available tree trunks and formed one room. Larger peasant houses could add a second room with another tree length, but the outer walls were always limited by the materials in this way.

Building materials were not always wood; some regions were rich in **stone,** and others depended on **brick.** Houses varied also by their location in the country or in a town and whether they were the poorest kind or had more luxury of space and privacy. Most medieval houses seem to have housed single families, not extended families. Large houses included space for **servants.**

Privacy was unknown in early medieval housing arrangements. People assumed that they would sleep in groups. Children slept together or with their parents. In wealthier houses, servants slept in a communal room or bed or in their masters' rooms or beds. **Knights** slept on benches or on the floor in a communal room of a **castle.**

A typical peasant hut in England, France, or Germany around 1100 was made of a timber frame filled in with wattle and daub construction. Wattle was a woven wall of pliable branches, usually hazel or willow, woven tightly around upright posts. Daub was the mixture of heavy clay, dung, and finely

chopped straw that was plastered over the wattle. Daub was thick, and it filled in the cracks in the wattle. It remained breathable, able to expand and shrink with the moisture, heat, and cold of the house. Wattle and daub construction did not last a long time, but it could hold up for 10 years, and it was reasonably well insulated. A wattle and daub wall could be painted with lime to whitewash it.

A large peasant hut was one tree length wide but several tree lengths long. The rafters and trusses for the roof were made of timber and could be somewhat arched. These timbers had been squared off by carpenters, and the spaces between the weight-bearing timbers were filled in with smaller ones. A large timber-framed house that was to be filled with wattle and daub had to create either long slots between upright timbers or large squares between uprights and crossbeams. These spaces were filled with posts by carving slots or holes into the inside edges of the timbers and fitting in strong but flexible posts. Alder, willow, or thin green oak strips were woven tightly to fill the spaces. Daub could then be put over the whole. Houses in towns sometimes whitewashed over both daub and timber for an all-white look.

The roof itself was nearly always thatched across most of Northern Europe. Thatch was a thick, tightly bundled mat of marsh grasses or wheat straw. If it was properly made, it was weatherproof and could last many years before it needed to be replaced. Thatching was a traditional craft with its own set of skills and tools. Thatchers used very long **iron** needles and hooks to pack bundles of reeds or straw as tightly as possible and stitch them to the rafters underneath. Strips of green wood were turned into large staples called spars. As the thatchers used rakes to comb the thatch smooth, they pounded spars in to secure it. The ends of the thatch were trimmed and sometimes even sculpted into decorative shapes. A new thatch roof was more than a foot thick, and, when rain fell on it, not more than the top few inches got wet. A thatch roof was steep and shed water and snow well, and it kept the house well insulated. Thatch did not last forever, but some thatched roofs have lasted as long as 100 years, and even the cheapest kind of straw was good for a decade.

Doors were wooden, hung with leather or iron hinges. Peasant houses did not have many windows, since windows were a liability in the winter. Windows were open to the weather but had heavy wooden shutters to lock closed. Some peasant windows could be covered with greased linen or **paper** so that they kept out wind but let in light. A more expensive window treatment was a thin slice of horn, which was as translucent as early **glass** and much less costly. The only source of heat was an open hearth in the center of the room. An opening in the thatched roof allowed the smoke to go out, but the ceiling was always smoky. Peasants commonly suffered eye and lung disorders from the chronic smoke. Floors were dirt or wood and were often

covered with grasses or rushes. These rushes would help absorb the scraps and crumbs and could be swept out periodically and replaced.

The house was divided into a general room for cooking and working, an area for sleeping, and an area for animals. In cold climates, **animals** were likely to be under the same roof, but partitioned off. The heat from the animals helped keep the people warm, and it was easy to feed or milk the cows or goats in winter. The house interior was generally dark, especially when it was too cold to keep doors or windows open.

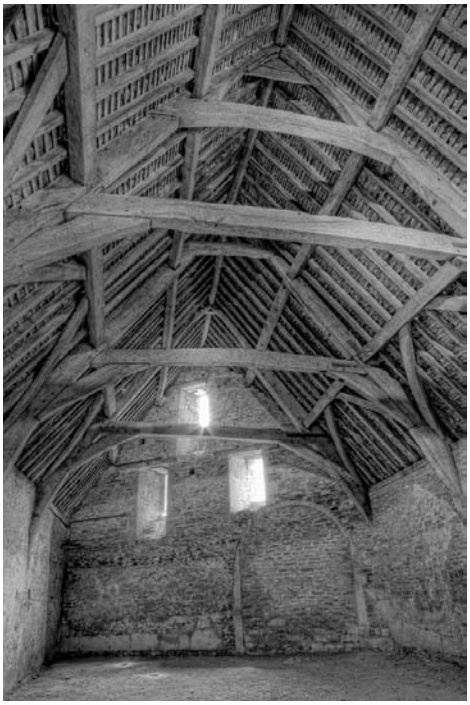
A simple house in a town was similar, except that it was usually two stories. A timber frame carried the living quarters above the shop area, with a narrow stair connecting them. Wattle and daub was still the most common building material, and, in many towns, thatched roofs were the most common. Massive, tragic urban fires made late medieval **city** governments pass ordinances against thatch. Builders had to look for roofing materials that were less flammable. Slate was fireproof but usually very expensive, while oak shingles were only somewhat safer than thatch. Ceramic tile-making technology in Italy had continued since Roman times, and the use of **tiles** slowly spread as northern cities searched for alternatives to thatch. Tiles could be flat, or they could be flanged and curved to fit together. Most tiles had a hole molded into the top, which was hung on a wooden peg along the rafter. Flat tiles overlapped each other to cover these holes, but flanged tiles, which shed water better, needed curved tiles to fit over the joins. Ridge tiles covered the peak of the roof. Tiles gradually became the favored urban roof material by the end of the Middle Ages.

In the Mediterranean region, houses were more often made of stone. A village house in the Pyrenees region of southern France or northern Spain hugged a hill and was built of stone. It had a main room with a central hearth and a side room for sleeping. Wattle and daub might form a side room or shed. As in the northern regions, animals were often under the same roof. In the Netherlands region, neither stone nor wood was plentiful. Especially in towns, builders gravitated to brick. Brick was also extensively used for building in Italy.

In the country or in a town, the house generally had a poultry yard around it. Even in towns, people kept small animals like chickens and pigs. In the country, small animals were hemmed in by a fence or roamed nearby **forests;** in towns, they often roamed the streets. Country houses had a barn, if the barn wasn't part of the house itself. Fine houses in a city, like manor houses, also included outdoor space for **gardens.** These gardens were both functional and beautiful. They were prized as much for the space and privacy they gave the house's residents as for the plants they grew.

Manor houses, where the landowner lived, were larger versions of a peasant's house. Early medieval manor houses were timber framed and built with wattle and daub but were larger and had a second story. The ground

In this late medieval house, the animals still share the same roof with the people. There is more furniture than in earlier times; the woman holds her baby while sitting in a real chair, not just on a stool. But the house's structure had not changed since Europe's earlier days: it is framed with heavy timber and filled in with wattle and daub. The background's brick church and post mill suggest a setting in Flanders. (The British Library/StockphotoPro)



Although stone medieval buildings have always been more famous, wood was the dominant building material for the average person. Most houses were small, built of timber framing with wattle and daub, but barns had to be large, open, and unusually strong. This medieval tithe barn in Wiltshire, England, is a good example of the way medieval carpenters framed large buildings. Many large beams made from whole trees have been used to support the roof. Medieval carpenters used few nails; they depended on accurate carving to fit pieces together when they were hoisted into place by foot-powered cranes. (Dreamstime.com)

floor had a hall where the master carried out farm business; it could also be used for **feasts.** The hall was often as tall as the house and open to the rafters. This permitted the hall to remain airy even when a large number of people, and several fires, were in the room. By the 15th century, some halls and reception rooms that formerly had been open to the rafters were subdivided. Beam and panel ceilings were installed in these rooms.

The kitchen was usually in a separate wing in order to guard the main house against fire. Sometimes it was in a separate building, but connected with a covered corridor. The kitchen was surrounded by smaller rooms or outbuildings that supported its work: a scullery for washing dishes, storage rooms, a brewery, a bake house, a dairy where butter and cheese were made, and livestock outbuildings such as a poultry house.

In manor houses and monasteries, where the kitchen prepared food for a large number of people, it was one of the first rooms to receive thoughtful design attention. A well-built late medieval kitchen in an abbey or castle had many windows for light, placed high in the walls. Its floor was tiled, although most kitchens still had beaten dirt floors. The floor had a drain with an iron grate over it, so slops could run off while discarded bones and vegetable matter were trapped by the grate and didn't clog the drain. Another convenience was a louver, a roof vent that could be closed or opened

to let out smoke. The best louvers were shaped like lanterns; wooden slats on each of the four sides could be closed or opened by pulling strings that hung into the kitchen. A good kitchen had a fireplace with a chimney made of stone, tile, or plaster, but, until the invention of chimneys, fires had to be placed in the center of the room to keep the wooden walls of the kitchen from catching fire.

Second-story rooms were bedrooms. By the 13th century, ideas of privacy were more important, and those who could afford separate sleeping rooms had them. Even so, children might sleep with their parents, leaving the other room for servants. Manor houses had separate barns, usually several barns for different kinds of animals. The poultry yard was kept apart from the main house. The grander the manor house, the more developed its outdoor space. Flower and herb gardens were as important as functional barns and meadows.

A manor house often had painted walls. **Castles** could afford expensive murals on their walls, so humbler houses of the wealthy imitated this style. Walls were generally whitewashed, and then an all-over pattern, perhaps imitating the lines of a stone wall, covered the white. Painters used stencils to put flowers or diamonds in the blocks. After the 13th century, wall **tapestries** were the fashion. Most manor homes could not afford a real tapestry, but they could hang a **cloth** with a painted scene in imitation of a tapestry. Floors were never carpeted until after the Middle Ages; carpets were only insulation and decoration for walls.

The greatest innovation in medieval house construction was the chimney, which was first developed in the only houses where the construction was always of stone: castles. Early castles were just as simple as most houses; the keep was a block tower with only a few large rooms. But castles of the 12th century began to plan halls with upper stories, and they built fireplaces and chimneys into the walls. The second story benefited from the chimney's heat as it passed to the roof. A wall fireplace with a chimney moved the smoke quickly out of the hall, and the fireplace design radiated heat better than a central hearth. Early chimney design began with a flue going back at a 45-degree angle into a channel cut or built into the stone wall. Castles in the 13th century used a vertical chimney flue that was one or two stories high. The fireplace had a stone hood or canopy to help collect the smoke as it drifted out of the fireplace and channel it back into the chimney flue.

To keep rain and snow out of the chimney, either a lantern or a chimney pot could be used. A lantern was a raised roof over the chimney. At its best, it was shaped like an octagon and could be ornamental, like a small tower. The chimney pot was made of unglazed **pottery.** It was an upside-down pot with holes cut out of the sides. It protected the chimney from rain and snow, and, as wind blew through the side vents, it created a cross draft that

drew smoke out of the chimney more efficiently. Chimney pots were in use by the 13th century.

Halls that were already built had to be redesigned to incorporate a fireplace and chimney. There had been a gradual movement toward isolating the smoky fire pit with wooden screens, creating a "smoke bay." The screens channeled the smoke toward the hole in the ceiling. Chimneys could be built into these spaces; a chimney was smaller than a fire pit, but it had to be made of fireproof material like brick or stone. As bricks became more readily available in the 14th and 15th centuries, they provided a way to retrofit an older house with a chimney. Chimneys brought their own maintenance problems; with the soot now out of the room air, it cooled and stuck inside the chimney. This cooled layer of soot was itself flammable and had to be cleaned regularly. Early chimney sweeping used brooms, bunches of twigs on rope, and even geese. A live goose, raised and lowered by a string around its neck, flapped its wings in panic and cleaned the soot efficiently.

By the late Middle Ages, both city and manor houses began to incorporate chimneys. The fireplace and chimney had to be built of stone, and, in a town, the chimney had to rise well above the roof. By removing the fire to the side of the room, medieval builders allowed freer movement around the room, and the style of living changed. More rooms could be kept warm, and family members began spending time in separate apartments. Tall rooms that used to reach to the rafters were more often subdivided with a second-story room above and ceiling below. The brick chimney in the upper room kept it warm, and some upper rooms had a fireplace of their own, with a separate flue built into the chimney.

Fine houses in town had the latest kinds of furnishings. Floors were usually tiled, while in humbler houses they were still made of beaten dirt. The houses were three and four stories high, and some of the most palatial city houses had pulleys to carry supplies to the top floors. Top floors had galleries and windows with clear or colored glass. The room layout permitted rooms for business, family life, feasts, study, and sleeping privacy. Private-use rooms on upper floors were usually called solars.

The cities of Italy developed distinctive town house styles. In Genoa, for example, each neighborhood housed an extended family enclave. The family's main house had a defensive tower and a small fortress, since there had been civil wars within the city. This main house had a narrow front but extended about 50 feet back from the street. On its ground floor, it had an arsenal, a large kitchen, and a central living room. Upper floors had family bedrooms, and top floors housed servants. The defensive tower connected to all these floors with a winding stair. The surrounding enclave had a bath and a loggia where people gathered. The loggia was a pillared walkway on either the ground floor or upper floors. In a hot climate, it provided a cool place to sit or walk. In the enclave, the family operated shops and markets

around the nearby square, and smaller houses held more generations of the family. These houses were more often built of stone or brick and were usually smoothly plastered.

By the late Middle Ages, a genteel house in town had tiled floors, handsome doors with good brass hinges, glass windows with hinged shutters, and plastered walls. There was a large fireplace with wrought iron fire implements and a shelf for a **saint**'s image or pewter flagons. Upper rooms had windows, balconies, and even private **latrine** closets. Benches had cushions, and beds had feather mattresses. The late medieval ideas of a good house blended into early modern ideas of safety, warmth, and comfort.

See also: Bricks and Tiles, Castles, Furniture, Gardens, Latrines and Garbage, Water.

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Hunting

Hunting was the most common theme for **tapestries** and wall **paintings.** It was the sport of aristocrats, and at times ladies participated. Although they ate what they killed if the **animal** was edible, **food** was not the point for aristocratic hunters. Hunting was a show of conspicuous wealth and power: it required **horses,** dogs, hawks, **servants,** and land, as well as the time to engage in it. It was the excitement of fighting and killing, but it did not require the danger and devastation of war. Commoners might trap rabbits, but they were not permitted to hunt, which was a privilege of the aristocracy.

Venery was the sport of hunting with dogs. Aristocrats who hunted with dogs needed kennels and a professional staff, although minor aristocrats and **knights** could keep a few dogs and hunt by cooperating with friends and their dogs. Falconry was even more the sport of kings, since training a

falcon required special knowledge and large amounts of time. Falcon trainers were a real luxury, even more than the keepers of dog kennels. Some kings gave falcons to each other as gifts, and some kept a favorite falcon in their chambers.

Professional hunters, who were responsible for filling **castle** tables, did not hunt in large parties the way aristocrats did. The most basic hunting tools were the bow and the trap. Especially in England, most men were proficient with the bow. With just one dog to help track the deer, a few men with bows could quietly bring back several deer. Archers could also shoot hares, rabbits, or birds.

Trap hunting was even more common and not at all aristocratic. Peasants knew how to set spring traps for hare or birds, using bait as a lure. They could imitate birdcalls to draw birds closer. Large animals could be caught by being driven into enclosures, and mid-sized animals could be driven into nets. Nets and bags were used to catch falcons and hawks in their nests or when as young birds just beginning to fly.

Medieval Europe was still rich in game animals, although by the 15th century, some had become so uncommon that they were rarely seen. The chief game animals were the deer and the boar, and their range remained wide across the continent. Some game animals were kept in park preserves enclosed by ditches and hedges. Gamekeepers watched over the herds to make sure they remained healthy and did not get hunted too extensively.

Red deer and roe deer were native to England, while fallow deer were native to the European continent. All species of deer lose their antlers each year and grow a new set; each year the stags grow one more point on their rack, so their age can be told visually. Medieval huntsmen always wanted to

The dogs have been tied up so that they can watch while the newly killed stag is cut up. When the huntsmen have finished the job, they will blow their horns and allow the dogs to eat a leftover portion of the animal. This ceremony, called the curee, kept the dogs eager for any work or danger that came with earning their reward. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance,* 1878)

chase the oldest stag with the most points, and they called small young deer "rascals" who wasted the efforts of the hunt. Hunters also respected certain hunting seasons for the different types of deer, male and female, as modern hunters do. It was not as important with smaller, less valuable deer, but with the larger ones, it was imperative to permit the young to grow into maturity so they would not be overhunted.

Deer may have been most plentiful in England. The Normans imported the small, fast-breeding fallow deer from the Mediterranean region into their enclosed parks to keep them at hand for easy hunting. Roe deer were the native small breed but were not valued as hunting quarry and were not protected in parks. In English, the fallow and roe stags were called bucks, and the females were does. Red deer were the largest and cleverest deer. They were the premier hunting quarry and received the most attention and skill in venery. The stags were called harts in English, and the females were known as hinds. Most medieval treatises on hunting deer focused on harts.

The wild boar was hunted in the winter. Boars were killed with long spears and were very dangerous. Men often died hunting boars, and even more dogs died. A boar's tusks were very sharp and could easily gut a dog or slash open a man's abdomen. Boars were fast and unpredictable. They were much valued as food; roast boar was a traditional food for winter **feasts.** For the sake of their taste and for the excitement of the hunt, boars remained a top game animal for the aristocracy.

The hare was native to both England and continental Europe and was often hunted for food by all who could snare or shoot them. Some aristocratic hunts chased hares for sport, using packs of dogs. The hare was a swift and clever animal that often ran in wide circles to disguise its tracks. The rabbit (or coney) was not native to Europe but quickly spread and was imported to England in the 13th century. It was not valued as a hunting prey and was more often farmed or trapped.

A limited number of other animals were hunted for sport or food. Bears were considered good hunting in Spain and Portugal and at times were hunted in Northern Europe. By the late Middle Ages, they were scarce. Otters were not eaten, but they were hunted in ways similar to deer. Some dogs were good at swimming and were known as otter hounds. Lynx and wildcats still lived in some parts of Europe and were occasionally hunted, but they were scarce, and they were not considered a noble quarry. Peasants killed badgers for shoe leather.

Wolves were hunted for extermination, not for food. They were not even hunted for sport but were so looked down on that they were trapped and poisoned. Some believed their bite was poisonous. A wolf's fur was warm and made an impressive lining. Foxes were valued as a very enjoyable quarry in a hunt, as they are today. Dogs could follow them easily, and they were not dangerous. Their fur was valued more than the wolf's.

Venery

Venery was the art of using a variety of dogs as a team and employing strategy appropriate to the prey and the terrain. Hunting dogs went to the hunt on leashes, controlled by trainers who could follow the huntsman's signals to leash or release their dogs at the proper time. Some dogs were leashed in pairs and released as packs, while others worked alone. Breeding the right kinds of dogs was its own full-time profession, as was training each type of dog to its task. Some particular dogs became internationally famous or were featured in poems about hunting, since they were the most outstanding of their type. They were sought after for breeding.

Small hunting dogs that ran in packs were known by many different names. They could have been different breeds or fairly similar. In medieval hunting treatises, they are known as brachets, crachets, harriers, coursers, or raches. They may have been similar to modern beagles, with large noses, droopy ears, and big eyes. They were strong and fast; their main job was to run fast and far. They were not expected to bring large prey down at the end of the run. Harriers were particularly trained to chase hares, but they also were used against other prey.

Greyhounds were large and thin. They were very fast, with narrow heads and large jaws. They hunted by sight and could catch up with a deer and bring it down with their jaws. Greyhounds came in different sizes and perhaps slightly different breeds; good greyhounds were bred in Scotland. They were supposed to have gentle dispositions outside of a hunt and were among the dogs permitted into the lord's hall.

Alaunts were like greyhounds but were stronger and could hold a fiercer prey. They had larger, blunter heads and very strong jaws. They could be used for hunting deer but were the only kind of dog suitable for hunting wild boar. The heaviest kind of alaunt was also used for bearbaiting. They may have been similar to modern pitbulls or German shepherds, but, in the Middle Ages, the best ones came from Spain. Alaunts had more violent temperaments and were less intelligent than greyhounds. They had to be kept leashed and muzzled.

Lymers were specialized tracking dogs, very much like modern bloodhounds. They were kept leashed and were used to locate the scent of the quarry. They were trained to run long distances following a specific trail, to find it again if it were momentarily lost, and not to bark. Very few lymers were needed in a hunt, and they were trained to work alone. Lords who kept large packs of hunting dogs had at least 20 other dogs for every lymer.

Mastiffs were large, coarse dogs used as guard animals by shepherds and as hunting dogs for particularly difficult prey. Mastiffs were shaggy and large, and they were not purebreds. They had large teeth and often wore spiked collars, since they guarded flocks against wolves.

Spaniels and setters, and sometimes greyhounds, were trained to find and call attention to quarry, particularly kinds of birds such as quail or partridges. They went out with falconers, and at times the greyhounds needed to help a falcon kill a large bird such as a heron. Spaniels and setters only found and roused birds. Other small dogs had their roles, but not necessarily in an aristocratic hunt; terriers, for example, caught rats.

Royal kennels could be very large operations, with 30 full-time huntsmen and pages caring for up to 100 dogs. The chief huntsman and his clerk were at the top; at the bottom, some kennels allowed a few poor men to sleep with the dogs for no wages. The kennels were warm, safe places, better than the streets for the poorest.

Most huntsmen began as pages when they were young boys. They lived with the dogs and learned all their names, and they cleaned the kennels and changed the dogs' straw bedding. Some kennels had straw-covered posts for the dogs to urinate on, with channels in the floor to carry the urine away. Kennels had enclosures where the dogs could walk and run, and the pages took them out for walks on the grass. Pages brushed the dogs and made leashes and collars. They looked for lost dogs, clipped toenails, and soaked sore feet in vinegar. They were in charge of feeding the dogs their ration of bread. Sick dogs might be fed tripe and blood from sheep, but healthy dogs were not fed meat at home. Their trainers wanted them to associate meat with hunting and expect to find it only in the **forest.**

As they got older, pages moved up to varlets, who helped handle the dogs on a hunt. They learned how to track animals and interpret their marks and droppings. They learned how to blow horns and how the hunt was organized. Although they no longer lived in the kennels, some were expected to keep a lymer in their rooms. As they moved up to the status of full huntsmen as adults, they received higher wages, grander clothes, and horses to ride. They still remained in close contact with the dogs, training them and maintaining the dogs' primary attachment. They had to oversee and give orders to the varlets who held the dogs on leashes, and they carried yard-long sticks to slap against their boots as signals. They carried hunting horns and swords and knives to help finish off game. Lesser huntsmen who remained on foot carried spears.

Huntsmen wore practical clothes without loose sleeves or long tunics to catch on branches. In summer, they wore green, and in winter, gray. They wore unusually high leather boots as protection against brambles. Not all hunters followed these rules, but the professional staff in many illustrations appears to work with rudimentary ideas of camouflage. At other times, especially in the late Middle Ages, they wore the household livery, which may have been gaudy and very far from camouflage.

Hunting horns were most often made of the horns of cattle. Some were made of brass and operated like modern bugles. Horns made of cattle horn

were often bound in **silver** or **gold,** and the most expensive royal horns were carved from ivory. All the hunters, professionals and aristocratic amateurs, carried horns. They were all expected to use a communications code of horn calls. Certain calls signaled types of deer or danger from wolves. Other calls told the hunters when to assemble or what to do with their dogs, and the dogs were trained to come to some calls. Some calls asked for water or help. One such music was reserved for the death of the quarry, and the dogs joined in with barking.

Dogs were expensive investments and merited more care than most medieval animals. When a lord took his dogs a long distance to hunt in a certain forest, he often arranged to carry them in baskets or cages. The dogs had to be in their best shape when they arrived. Some dogs that were used for hunting dangerous prey were given quilted dog armor to help guard against claws and teeth. Dogs were frequently wounded while hunting bears and boars. Their kennel staff used needles and thread to stitch gaping wounds and sometimes used the ammonia of urine to sterilize a wound.

The day before a major deer hunt, or very early the same morning, one or more lymers and their handlers scouted the forest for suitable quarry. Some medieval illustrations show huntsmen studying the deers' droppings on a table; they were able to estimate age, size, sex, and general health. They studied other signs, such as where the deer had rubbed its antlers on a tree, and they measured the size and depth of its tracks. They wanted to find the best hart for the chase, and sometimes they were able to sight one and count the points on its antlers. Deer tend to stay in one area of forest, called a covert; before leaving, the huntsmen used the lymers again to tell whether the harts they were studying had left the covert or not.

After the preliminary work was completed by the professionals, the aristocratic amateur hunters arrived. As the hunt opened, huntsmen took groups of dogs to relay points, depending on the terrain. They expected the first dogs to drive the hart past them so they could release fresh dogs to join the tired ones. A huntsman and his lymer went to pick up the scent of the selected hart. When the huntsman was sure the hart had noticed their presence and was running away, he tied the lymer up and blew his horn. The running dogs entered the chase.

Huntsmen followed the progress of the dogs and communicated with each other by signaling with horns. Each hunter and his set of dogs (brachets, harriers, greyhounds, and alaunts) worked to follow the same hart, not other deer, and make him run until he was tired. A tired stag turned to fight with his antlers; this was known as the stag being "at bay." Now the hunters and dogs closed in, and, after a short time when the huntsmen and dogs enjoyed the excitement, the hart was finished off with a sword or spear. The hunters blew their horns, and sometimes they permitted the dogs to bite the dead animal's throat to keep their primitive hunting instincts fresh.

The dogs received their share of the kill in a ceremony called the *curée*. After the stag or boar was dead, the hunters leashed the hounds, which waited while the deer was cut up. The dogs eagerly awaited the portions left for them, which were entrails and blood-soaked bread. A hunter, or the lord, held the animal's head over the portion for the dogs, and the other hunters blew their horns. The dogs were released to devour their portion. The lymer often received the prize of being allowed to chew on the head before it was taken back as a trophy.

The fallow buck was not hunted with the same scouting process using lymers. Hunting a buck was less organized; the pack of running dogs was permitted to find the scent on its own. Roebucks were the smallest deer, the least useful for feast tables. They had great running stamina, so hunters used relays of dogs to chase them. Some hunters did not consider them worth eating and used them only to train dogs.

Another medieval hunting method was to drive the quarry toward a hidden group of archers. This method may have been the oldest, and it seems to have been the Anglo-Saxon method; it was also used for does and hinds during their hunting seasons. Ladies who participated in hunting were restricted to this method, which was safer and usually took place in an enclosed park. The royal party with its ladies went to an appointed place and hid with their bows. Hunters with a few dogs drove the deer toward them. Sometimes long lines of people helped corral the deer into the preferred path toward the archers; they were known as the "stable." Deer parks could be designed with natural features to create a stable, or hunters could put up barriers or nets. When the group of hinds ran past the hidden archers, the ladies could try their shooting skill. One arrow was not always enough to kill a deer, but the hunters were nearby to finish them off with knives.

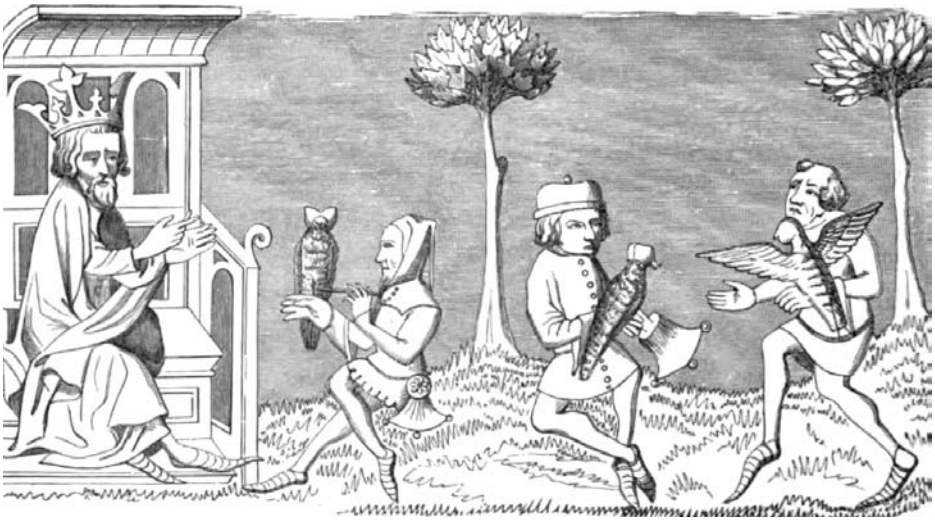
Falconry

Falcons and hawks are natural predators of birds and small mammals, but, although fierce, they can be tamed. Both are raptors—birds that kill live prey—and diurnal hunters, not nocturnal like owls. Hawks follow their prey at a low altitude, while falcons swoop down from above. Falcons have a wider wingspan than hawks. Falcons were more often used in medieval hunting, so the sport is generally known as falconry. Falconry was especially popular with ladies, since they were strong enough to ride a horse and hold a small bird. It was the most popular kind of hunting in medieval Spain and Italy, perhaps because game was smaller in these warmer, more settled regions where deer had become scarce.

Female falcons and hawks were always larger and stronger, and better hunters, than males. The largest of the raptors were the Greenland gyrfalcons, which were strong enough to catch water birds like cranes and herons,

as well as small animals such as hares. They were heavy and hard to train, and they were relatively scarce. Peregrine falcons were more common; they were native to Africa and Europe and were the most common Spanish falcon. The merlin was a small peregrine hawk used to catch birds up to the size of quail. Some minor falcons are not well-known today. The hobby was a very small falcon, too small to use for useful prey but a good starting bird for beginning falconers. The saker was an Arabian falcon used in Spain, while the lanner was a bird whose range used to be all over Europe but is now restricted to the Mediterranean. Two raptors were true hawks, the goshawk and the sparrow hawk. The goshawk was larger and could catch hares as well as quail and even herons. The female sparrow hawk was a convenient size for many ladies to carry, and it could take down small birds like larks or even partridges.

Most birds were captured in the wild. Young adults were favored, since birds in the nest were easy to tame but did not know how to hunt. Falcons were gentler and easier to train than hawks, and some lords kept a favorite falcon in their chambers. All training followed basic principles that began with blinding the bird, either by covering its eyes with a leather hood or stitching its eyelids closed. The bird became dependent on human contact for food and grew tame. When its sight was restored, it was trained to fly away and return to its home and to sit on a keeper's leather-gloved fist. It



Falconry was the noblest, most expensive sport, so it was often pictured in books and on walls. Trainers learned to know everything about their falcons' health, habits, and personalities. They trained the birds to believe that the way to be fed meat was to catch some prey and bring it back whole, in order to get a bit of raw chicken from the trainer's hand. The bird's view of the world had to be carefully shaped by the trainer, who kept its eyes covered with a tiny leather hood much of the time. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

wore jesses—leather collars around its ankles—each with a ring to which a leash could be clipped. In many regions, birds wore tiny **bells** to help the falconer find them after they had seized prey. They were also trained to seize a lure that was shaped somewhat like a bird, with meat attached, and whirled through the air on a rope. This allowed the falconer to recapture a bird. The birds also had to be trained to go after prey they did not naturally favor. Large birds, such as herons and cranes, required special training to give the falcon or hawk confidence. Most cruelly, some royal trainers used crippled live cranes. In some training, raptors were permitted at first to eat the prey, but they were otherwise strictly trained to think that bits of meat always came from the hand of a human.

Falcons and hawks lived in mews, if they did not live in the trainer's or lord's chamber. The mews were kept clean, with sand sprinkled on the floor, so the keepers could tell if the birds were coughing up or excreting materials that indicated illness. The birds sat on perches both in the mews and in the cages (at that time spelled *cadges*) that transported them. The cages hung over a man's shoulders on straps and were filled with padded perches. Because falcons were such expensive creatures, their veterinary care was the greatest of all medieval animals, even more than dogs and horses. All falcons and hawks molted once a year, losing all their feathers and growing them back. During this time, their keepers watched their health anxiously, and keepers employed favorite methods for helping the feathers regrow as quickly as possible.

In the hunt, both dogs and human assistants were needed. Spaniels and setters helped locate the birds or hares and could chase them into the air or into the open. Some falconers paid small children to beat the bushes so ground birds or hares would dart out. When the birds killed game across or in water, either the dogs or the beaters were expected to swim out and retrieve it. A well-trained falcon brought its catch back to its master's feet. The bird was rewarded with meat tidbits, and the hunters cut up the game in an informal *curée* ritual so the raptor could be rewarded with pieces of its quarry.

Falconry was the main source of game birds such as partridge and quail. In some places, by the 15th century, commoners were catching and training falcons and hawks. Falconers also went to war with kings to provide entertainment and to catch game for dinner between battles. Expert falconers were in demand all over Europe and often found employment in foreign courts.

See also: Animals, Forests, Robin Hood, Weapons.

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Hygiene

It is widely believed that people in the Middle Ages were very dirty. This is at least half a myth. Many people were dirty because they had occupations that left them soiled, and whole-body bathing was expensive. But a great deal of daily washing was routine for all but the **beggar** class, and, in many of the medieval centuries, there were whole-body baths of some kind going on in many regions. Hygiene improved through the Middle Ages but dropped again with more crowded conditions and industrial waste. The **plague** forced a crisis of public hygiene because many bodies had to be buried quickly, and it was difficult to stay clean.

Roman society had prized cleanliness, and most Roman cities had public baths. Italian **cities** inherited this infrastructure, and some cities were able to maintain it. Even in the disorganized period after the barbarian invasions, many Italian cities and towns kept up public baths and even tried to build new ones. Some bishops sponsored public baths near their **cathedrals.** Public baths, even including soap, became part of alms for the poor. By the 10th century, public baths were no longer as popular in Italy. Those who could afford them built bathing rooms in their houses.

In Benedictine **monasteries,** the norm was that the monks washed their faces and hands several times a day in a trough of cold **water** and bathed their whole bodies in warm water up to four times a year. They washed their feet once a week and had their heads and faces shaved every two or three weeks. Monasteries and convents sometimes placed washstands in each cell. This washstand had a basin to catch wastewater, a water reservoir of some kind that could hang above the stand, a shelf for soap, and a rod for a towel. A public lavatory with a permanent washbasin sometimes was equipped with a roller towel.

Most people washed their faces and hands daily. The wealthy washed their hands before and after meals, since they ate with their fingers. At a **feast,**

servants known as ewers carried around pitchers of water and bowls to catch the wastewater. They poured water over guests' hands with specially shaped aquamaniles or simply with pitchers that also came to be called ewers.

By the end of the Middle Ages, some private homes in cities had washstands modeled after the lavatories in monasteries. On the wall was a hanging reservoir with a tap and, below it, some kind of basin to catch the water. The most advanced were built into the wall and had a drain hole to carry the wastewater down a pipe.

Physicians believed that sickness was caused by an imbalance of heat, cold, dryness, and moisture in the body and that opening the body's pores to outside influences could cause illness. Their opinion was that getting the body wet all over would open it to chills or fevers and was not safe. Washing anything but visible dirt from the face or hands was openly discouraged. However, being dirty was associated with being poor. People who could afford to bathe their whole bodies did so once a week.

These baths were in wooden tubs, with heated water, with a linen cloth laid on the bottom of the tub to guard against splinters. Wooden tubs were built like **barrels,** but coopers made them especially for bathing. They came in various sizes, from small tubs for feet or **babies** to large tubs that fit several people. They usually had two handles with holes so they could be lifted by hooks or on a pole and moved to another place. In large tubs, these handles were big enough to act as backrests for the bathers. The bathtub could be used outside in summer and by a fire in winter.

Aristocratic baths were a luxurious experience, even by modern standards. By the 14th century, kings of England had permanent bathrooms with piped-in hot water and tiled floors. A 15th-century manual for training **servants** stipulated that the bathtub needed sponges to sit on and to use for washing. Sheets had to be hung around it for privacy and warmth. For those who could afford these luxuries, water for washing and rinsing was scented with roses. By the late Middle Ages, aristocrats expected to find rose petals in all washing water. A full-scale bath was required before a ceremonial event such as a **wedding.**

For well-to-do royals or commoners who owned a wooden bathtub, the work of heating the water for the bath meant that more than one family member would benefit from it. Bathing was often a group activity, and nudity was not as shocking since there was little privacy for dressing and sleeping. Some medieval illustrations of public baths show several people in a large tub, with a shelf containing snacks along one side of the tub.

Some large cities had public baths as well as public **latrines.** The idea may have come from the public baths available in the **Muslim** world; some bathhouses used the symbol of a Turk's head to suggest their service. In medieval English, they were called stews. Some bathhouse owners built near the operations of bakers to make use of the heat already being generated.

A bath scene illustrates a 15th-century tale about King Arthur's knights. The artist depicts a bathtub accurately: the tub was a large, wide half-barrel that needed a linen lining to guard against splinters. Perhaps the fantasy stories of the Round Table knights have prompted the artist to show a knight in full armor attending on the bath. In reality, steel armor was kept dry, oiled, and as far from water as possible. But although no aristocratic medieval bather would ask a knight to attend the bath wearing armor, neither would he dream of bathing alone. A proper bath required a team of servants to fetch, carry, heat, pour, wash, dry, and drain. (Giraudon/Art Resource, NY)

The owners charged for steam or tub baths. In some, barbers offered shaving, haircuts, and services for bleeding and cupping (a milder form of bloodletting). People socialized in bathhouses and did not always keep them segregated by sex. Owners were supposed to keep out lepers who might pass on infectious disease and to prevent bathhouses from being used as centers for prostitution. Gradually, the price of firewood made bath operations too expensive. City governments viewed public baths as too commonly linked to prostitution and immorality and were afraid of contagion, especially after the Black Death. By the end of the Middle Ages, public baths were out of business on their own or closed by ordinance.

A much less common but possible alternative was the steam bath. The idea of the steam bath, or sauna, may have been introduced from the Middle East, where it was a bathing option that did not use much water. Enclosed in a small room, tent, or garment, the bather endured a small amount of water creating steam over hot coals. Herbs always went into the water to perfume the steam. After a steam bath, the bather needed only a quick rinse.

Medieval people had soap but may have used it more often for washing clothes than for washing skin. It was expensive because it used fat, which was precious for cooking. Soapwort, a washing herb, was the poorer person's alternative. Soap varied by region. In Northern Europe, animal fat was used. The wood ash used to make soap was high in potassium, and it made only soft soap that was kept in a small tub. In Mediterranean regions, soap was made with olive oil. Barilla ash was high in sodium and made a hard, pure bar of soap. Castile soap, imported from Spain, could be purchased from merchants. It was very expensive, and only the wealthiest aristocrats could afford it, perhaps scented with lavender.

Hair could be washed separately. Aristocrats probably washed their hair once a week, common people less often. The procedure for washing hair was to strip to the waist, with a pitcher of water and a wide, shallow basin on a floor mat. The hair washer knelt on the floor, bent over the basin, and used soap, the pitcher, and the basin to complete the task.

Shaving was not accessible to most common people, since it required water, soap, and a sharp blade. Only the wealthiest would have been able to shave every day. In towns with barbers, most men would go once a week. Barbers used straight blades that required real trained skill to manage without danger to the client. In monasteries, shaving was a routine matter, since monks were required to shave the tops of their heads, as well as their faces. They shaved once every two or three weeks. At first, the monks were supposed to learn to shave each other, but many monasteries had to hire a professional barber. Shaving was taking too long, and too many monks were getting cut.

Personal care beyond face washing varied greatly, but there were some possibilities. We are dependent on written **records** and pictures, and, although

we have few pictures of combing, brushing, and primping, the elaborate hairstyles of medieval men and women suggest a great deal of time spent.

Combs had been available since the early Middle Ages. The simplest ones, sold in the North during the Viking era, were made of two pieces of bone or antler. One had the teeth cut in it, and the other formed a riveted-on handle. Later combs were wood or bone or, in their most expensive form, ivory. Some were double sided. Mirrors were scarce, so most people probably used a still basin of water. When they were available, mirrors were made of highly polished brass or steel. Glass mirrors were invented in the 15th century.

Tooth care also must have varied greatly. Many people cleaned teeth with salt or green twigs. When teeth went bad, the barber pulled them. Bad breath was treated by chewing spices or rinsing with rose water. Clearly, this remedy was only available to the aristocracy, since spices and roses were very costly.

A great deal of **cloth** laundering went on in medieval times, but not everything was washed. Wool **clothing** was not washed; it was brushed and shaken to remove clothes moths. Furs, too, were brushed weekly. Once or twice a month, all the towels, sheets, undergarments, and shirts had to be washed. Clean undergarments twice a month was considered good hygiene. These white linen articles were boiled or scrubbed in soapy wooden tubs. Many women still washed clothes in the nearby river, even when it was polluted. (London records tell of many deaths of women who slipped while washing clothes on the banks of the Thames.) Laundry needed to smell clean to be considered clean. Laundresses for the upper classes folded herbs into the dry linens. They used lavender chiefly, but also chamomile.

See also: Cosmetics, Hair, Water.

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A

Ink. *See* Pens and Ink

Inns. *See* Taverns and Inns

Iron

Although the Iron Age, as defined by archeologists, ended with the Roman Empire, iron was still the most important metal for all weapons and tools in medieval Europe. As with other crafts, the fall of the Roman Empire brought down the skill level of mining and metalworking. During Europe's Middle Ages, these skills were reinvented and then surpassed.

Iron ore could be mined in many places in Europe, and primitive forges were widespread. The basic process of producing bloom iron could be done on a small or large scale. Iron ore was washed and roasted and broken into pieces for the reduction furnace. Medieval forges had a chimney and two openings: one for the ore to be added, and one for the lump of iron to be removed. A simple bellows kept a steady draft of air to make the fire hotter. The furnace burned charcoal, not wood, because charcoal drew out oxygen from the iron ore and made the finished iron stronger. The fire was not hot enough to melt the iron, so it came out as merely a lump that could be heated and shaped. The lump was called a bloom. The smith reheated the bloom in a charcoal fire to temper (soften) it, and then beat it into the desired shape.

In the early Middle Ages, most iron went into **weapons:** spear heads, swords, helmets, and axes. Only a few **tools** used iron. Most blacksmiths were located on estates and worked for kings and warriors. But as settlement spread, there was more demand for iron tools, especially plow blades. Towns grew, and their craftsmen needed tools, not just for **agriculture. Horses** now wore shoes.

Between 1100 and 1200, blacksmiths moved from estates to villages, where they could shoe horses and make tools. To make a carpenter's saw, the smith cut the teeth into hot metal; to make a file, he struck a stick of iron repeatedly with a sharp hammer to put ridges into it. Chisels had to be hardened by repeatedly heating them to temper the metal, which was particularly important for stonemasons' chisels and wedges. **Carts** needed iron rims for their wheels, and **mills** needed iron gears and other machine parts. Farms needed iron plows, horseshoes, spades, and hoes. **Kitchens** needed large iron cauldrons, fire tools, and long forks.

Blacksmiths did a wide variety of metalwork. While some forged simple tools or horseshoes, others repaired and sharpened tools for stone-cutting masons at constructions sites. Some made intricate lattice railings. Some blacksmiths specialized in nails; they turned out thousands of precise, well-made nails for a variety of specific uses. Blacksmiths were the original **clock**

makers, although clock making became its own craft in time. Blacksmiths could do precision work: hinges, clasps, window grilles, hooks, **locks,** and **keys.** Although locksmiths became their own specialty, they began as part of blacksmithing.

Making these increasingly complex tools, while at the same time improving weapons, forced smiths to innovate and learn how to work iron more efficiently. **Monasteries** were also a surprisingly powerful force in iron development. Cistercian monasteries were the most active force in mining and refining the iron of Europe. People donated to them land that had iron deposits, and they built factories to refine it. They recycled the slag as fertilizer. Along with learning the properties of iron when worked cold or hot, blacksmiths learned how to turn iron into what became known as steel.

Steel was a type of iron with extra carbon; its structure changed to a crystalline pattern, and it was stronger than ordinary iron. The earliest discoveries of how to make steel appear to have been in sword making with a technique called pattern welding. Thin iron rods were covered with charcoal and heated to red hot, and then wrapped around each other to form a solid bar. Early smiths probably did not realize the iron picked up something from the charcoal. If the steel was cooled very fast by being plunged into cold water, it became very hard but somewhat brittle. Slower cooling, perhaps with some reheating, produced the best result.

At first, steel was only imported from Sweden, Spain, and Damascus, the foremost iron centers. Blacksmiths forged steel edges onto iron tools and blades. The technique spread to armor-making by the 14th century, when plate **armor** was in development. The method was called case-hardening with armor. Plates were case-hardened by covering the outside with charcoal and heating it to red-hot again. The outer coating of steel allowed the armor plates to be polished like glass.

The need for iron was constant, and ironworkers needed ways to process iron ore more quickly. Waterpower was increasingly being applied to uses outside milling grain, and craftsmen had learned how to turn its spinning motion into many other kinds of motion to run industrial machinery. Waterpower revolutionized metalworking. A water-driven bellows could raise the temperature of the fire enough to liquefy the iron. Water-driven hammers were better at forging the bloom of iron than a human smith's hammer. The first record of a water-driven bellows was in 1323, and, by 1380, Flanders had a real blast furnace.

The medieval blast furnace was built over a fire pit, with a small hearth and a very large chimney. The chimney was roughly diamond-shaped, widening like an upside-down pyramid and then narrowing, and as high as 20 feet tall. Large twin bellows were operated by waterpower to keep a continuous draft. The blast furnace produced iron with 4 percent carbon because the hotter temperature made it take in the charcoal's carbon faster.

Iron technology drove the medieval industrial revolution. The heart of the iron industry was always the blacksmith, whose work became increasingly specialized. Some blacksmiths used early steel technology to case-harden armor and tools, while others turned to fine ironworks in machinery. Still other blacksmiths created larger industrial shops to make large iron girders for use in bridges and tall buildings. (William Caxton, *The Game of Chesse* [facsimile from the 15th-century original], 1872)

This lowered the melting point, so they now melted the iron to pour into molds instead of producing lumps of bloom.

The impure iron ore was mixed with limestone and then layered with charcoal. This mixture went into the blast furnace. The sand, clay, and limestone were lighter than the iron and floated as it melted. The waste was called slag and was removed through a door at the top. The molten iron flowed out into a sand pit to cool. Later the term "pig iron" came about because the molten iron was channeled through chutes into several sandpits or depressions to cool, which looked like the furnace was a sow and the pits were piglets. A cooled "pig" weighed several hundred pounds.

Pure iron required a further step. The 4 percent carbon was removed from the pig iron in a simple refinery. The metal was reheated with a separate

bellows to blow air into the molten metal. Oxygen combined with the carbon and blew away as smoke so that the iron was pure.

As iron manufacture became more industrial and less of a village craft, blacksmiths were perceived as nuisances in towns. Their fires were dangerous and smoke producing, and their work was noisy. Worse, as wood ran short, blacksmiths were among the earliest customers for the first **coal.** This coal produced noxious fumes, and, although medieval people did not understand the real dangers of industrial pollution, they believed anything that smelled bad must be unhealthy. Ironworks were pushed outside the city walls by ordinances and became increasingly industrial.

See also: Armor, Clocks, Coal, Kitchen Utensils, Locks and Keys, Mills, Tools.

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Islam. *See* Muslims

J

Jewelry

The word *jewelry* began as a term for a fancy gold centerpiece on a feast table, the *joyau* or *jouel.* It began to apply to personal adornment during the late 14th century, beginning at the splendid court of the duke of Burgundy. In medieval times, jewelry was not distinctively male or female, as it is today. Wealthy people wanted to show off what they could afford and reap the honor of high status. Men wore large jeweled brooches to hold their cloaks, and, when cloaks went out of use, they pinned brooches to their **hats.** The same heavy golden collar (necklace) or ring could be worn by either men or **women.**

During the 9th, 10th, and 11th centuries, European **clothing** styles were heavy and covered most skin. Brooches to clasp cloaks and belts to hold in all the layers were the most common jewelry. As fashion began to change more rapidly in the 13th century, necks, arms, and hair were more often exposed and could be decorated. Low-cut dresses allowed women to wear showy necklaces. Collars, necklaces, bracelets, rings, and headdresses were developed for use at court. By the 14th and 15th centuries, common people began wearing imitations of court jewelry using cheap materials.

Few medieval jewels have survived into modern times, and the ones that have are usually the largest and most historical, such as crowns kept safely in national museums. Other survivors were lost in their own time, either buried or sunk to the bottom of a river. The value of a piece of jewelry has always been in its materials and only secondarily in its design or workmanship. Jewels were inherited or sold, and the new owners often gave them to a goldsmith to recast them in the current style. The same gemstones were set over and over, and each age considered the old style unattractive and its own much better. Most of our knowledge of medieval jewelry comes from paintings and sculpture.

Gemstones and Beads

Gems, like anything from nature, had their own natural **magic.** They were believed to cure or ward off certain kinds of diseases or tragedies. Based on the *Natural History* of the Roman writer Pliny the Elder, medieval writers composed lapidaries, **books** about the properties of gems. Sapphires, for example, had cooling powers to cure headache and fever and made God more likely to answer prayer. Rubies were a charm against discord, and emeralds helped epilepsy. The popularity of lapidaries made them among the first books to be written in common tongues, as well as in Latin.

Amber, garnet, jet, and beryl were gems native to Europe. Amber was fossilized pinesap and occurred in abundance in the Baltic area, around modern Lithuania. The amber trade had been important since early medieval

Square-headed brooches were almost universal in early medieval Europe. The Franks and the Anglo-Saxons probably borrowed the form from Roman models. The square at the top held a hinged pin, while the cross shape at the bottom concealed the pin's clasp. The bridge between these parts held the gathered folds of a cloak or tunic. Brooches like these are found in many pagan graves. (Museum of London/ StockphotoPro)

times, as Scandinavian **ships** carried amber out of the Baltic Sea and traded it in France and England. Garnet is a mineral that came in a variety of colors. Its most common medieval form was dark red, as found in Bohemia, and some other forms came from Asia Minor and Russia. Jet is not a true mineral but is closer to petrified wood. It is pure black and can be polished to a glossy sheen. It occurred naturally in parts of England. Beryl is a transparent mineral that is colorless but often occurs with color tints. It had been known since classical times and occurred in many parts of Europe.

A few other minerals native to Europe made good jewelry. Rock crystal, a form of quartz, sparkled and could be used as itself or in imitation of other gems. It was not a real gemstone, but it was pretty and popular for many articles. It could be found easily in Germany and France. Pearls are not native to the Mediterranean Sea, and most pearls came to Europe from the Indian Ocean, but some river pearls came from Scotland (and later from Bohemia). A freshwater mussel that lived in Scottish rivers produced a small pearl that could be pierced and sewn onto clothing or mounted as a small gem. Toadstone was a fossilized fish tooth, but medieval people believed it came out of a toad's head. It was brown, and it polished well and was thought to bring good luck. Finally, Roman cameos were recycled into medieval jewelry. They had been left in Roman ruins, and people often

found them. In Italy, where they had been made from native two-colored minerals, they were even more plentiful.

Coral reefs along the African shore of the Mediterranean Sea provided most of Europe's coral. Coral was considered protective against lightning; its growth in the ocean was thought to give it special properties. It was good for children's beads, since children needed special protection. Coral beads were popular for rosaries and other jewelry. Coral also made early buttons.

Fine gemstones had to be imported from the East, so they were very expensive. Medieval jewelers favored brightly colored stones: red, blue, and green. Eastern traders brought rubies from India, sapphires from Ceylon and Persia, emeralds from Egypt, amethyst from Russia, and turquoise from Persia and Tibet. Some amethyst also came from Germany. Diamonds were not as popular, or as common. Jewish and Arab traders imported diamonds from India and Africa during the late Middle Ages, and diamonds began to appear in some jewelry sets.

Gems were polished, not cut, until the late Middle Ages. The classic medieval gem was opaque, colored, round, and smooth. Sometimes they were engraved. In the 14th century, some jewelers were cutting simple planes on gems. Although diamonds were the most difficult to cut, they benefited most in appearance, and their natural crystalline shape lent itself well to cutting.

Beads are the mainstay of much personal ornament. In addition to the expensive gemstone or **gold** beads that royalty could afford, there were less expensive options. Venice's **glass** industry made glass beads in many colors, and these grew to be among the most common for less expensive jewelry. Amber, Northern Europe's traditional bead, came in yellow, orange, and a very pale yellow that was nearly white. Whitby jet made shiny black beads. Red coral was a very popular bead material because of its protective properties. Rock crystal made a clear, sparkling, expensive-looking bead. Cheap beads could be made of bone, stamped from a rib and polished into a round shape. Rosary beads were originally made of pressed rose petals picked in a special rose **garden** devoted to the Virgin Mary.

Early Medieval Jewelry

Byzantine jewelry blended traditions of Greece and Rome with art brought back from the East. Their goldsmiths used gold wire and gold plate; they set gems into place with fine wire claws, often shaped decoratively. They set emeralds, sapphires, rubies, and diamonds into gold jewelry. They drilled and threaded pearls into settings with gold wire. They also created mosaics in gold jewelry by setting stones such as garnets, or pieces of colored glass, into patterns.

Constantinople was a very rich manufacturing and trading **city** with longstanding aristocratic families, so the demand for jewelry was high. The highest art went into crowns, which became increasingly heavy and elaborate. Sixth-century crowns were heavy bands that encircled the head; they were decorated with gems and had strings of pearls hanging down over the ears. The next stage of crown was a heavy series of plates, each with a mosaic of jewels showing a **saint,** that also had strings of pearls. The next stage used an arch that went over the top of the head and was also heavily jeweled. The last evolution of the crown used two heavy bands of gold, one above the other, and, above these, a series of points standing up in the classic crown shape used by modern cartoonists.

Byzantine aristocratic women wore large, elaborate earrings. They had pierced ears and wore dangles, hoops, crescents, and crosses. Pearls and gems were threaded on gold wire. Other articles that demanded gold and gems were belts, bracelets, rings, and brooches used to pin cloaks. Religious symbols were also jeweled. A noble Byzantine woman might wear a highly decorated, large gold cross on her chest, hung as a necklace. One specific type was the reliquary: it looks to us like an ordinary large gold cross pendant, but it contained a small box, covered by a jewel, similar to a locket. Some tiny religious **relic** went into the reliquary, and it was worn like a charm.

Before the Franks, Anglo-Saxons, Danes, and Swedes converted to Christianity, they buried gold jewelry in graves. There are treasure hoards like the one found at Sutton Hoo, and there are more modest finds. Even after becoming Christians, Frankish royalty still went to the grave dressed in silk and gems. They favored arm rings for men and necklaces and rings for women. They viewed jewelry as wearable wealth and believed in flaunting it on **feast** days. Their jewelry was large and showy, but its workmanship was crude compared to the work produced in Constantinople at the same time.

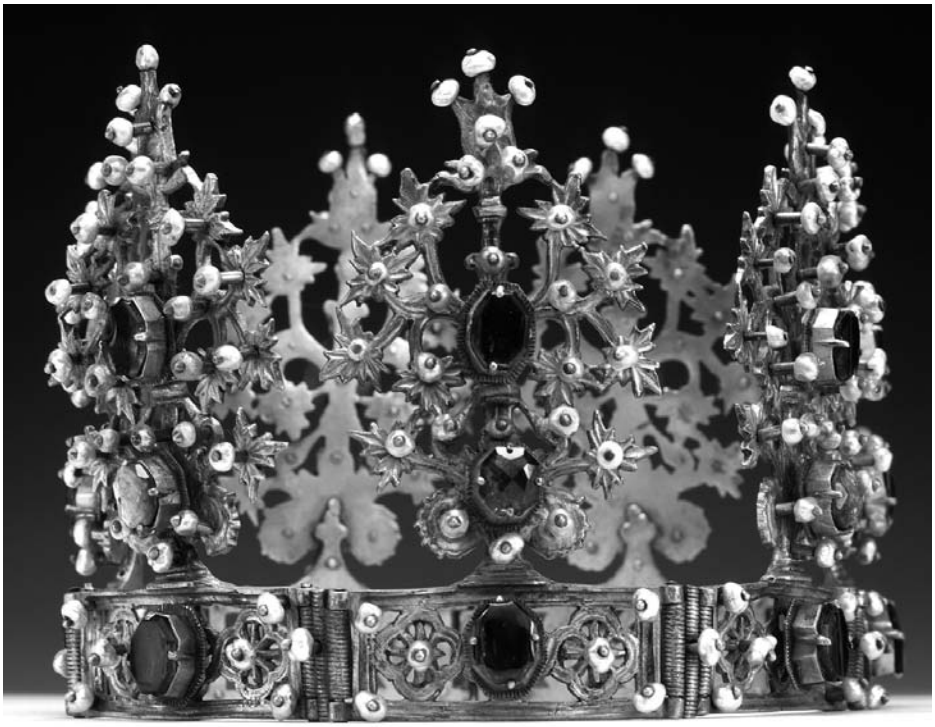
The earliest jewelry from Northern Europe comes in the form of pins and brooches for cloaks. The Franks, Anglo-Saxons, and others made large gold pins for these practical purposes. Saucer brooches were large gold circles with a clasp on the back, probably for pinning a cloak to the wearer's tunic at the shoulders. They came in pairs, often connected by a string of amber beads. Quoit brooches were thick circles that fastened the pin through the hole. The other main kind of brooch is known as a square-headed brooch. A square (or rectangle) of **silver** or gold was connected to a decorative lobed cross by an arched bridge. A pin ran along the back; the bridge allowed space for a woolen cloak to run through the pin. Brooches were always very decorative. They had fine decorations of flowers, scrolls, dragons, and **animals,** and many had amber beads mounted in them.

Europe's medieval jewelry developed from these traditions. Italian jewelry was always more influenced by Byzantine fashions, while Northern

European work developed first from large pagan pieces. As travel increased trade in the 12th century, goldsmiths in the North began to learn from and copy the southern pieces. By the 15th century, it was difficult to tell where a piece had been made just by looking at it.

Crowns, Brooches, Necklaces, and Rings

Most medieval jewelry was made for royalty, and we have mainly these very expensive, large, showy pieces in museums. At the same time, clothing before the 14th century was usually ample and heavy, and their greatest need in jewelry was for pieces that fastened clothing together. Their jewelry often came in the form of pins, brooches, and belt fastenings. They were simple and large, with large, round gemstones. Cameos were popular and even appeared in some crowns, alternated with gems. Cameos associated the medieval wearer with the past glories of Rome.



By the close of the Middle Ages, Gothic-style jewelry had become elaborate and fanciful. A crown was a once-in-a-lifetime opportunity for a goldsmith to show all of his skills. Gold, silver, pearls, and glass went into this 15th-century Bohemian crown. (Digital Image © 2009 Museum Associates/Los Angeles County Museum of Art/Art Resource, NY)

After the 12th century, the elaborate Gothic style influenced jewelry styles. The 13th century was a generally prosperous time, and jewelry proliferated until kings began passing sumptuary laws. Only royalty, aristocrats, and large landowners and their families could wear jewels or gold. Royal jewelry inventories from the 14th century are sumptuous beyond modern imagination. Edward II owned 10 crowns. The mistress of his son, Edward III, had more than 20,000 pearls. Queen Isabella of England, married to the king in 1396, was given at least five crowns and as many brooches as gifts from the king and his lords, all covered with rubies, pearls, sapphires, and diamonds set in jeweled gold. A French duchess owned huge jeweled headdresses covered with pearls and every other costly gemstone.

Royal crowns grew ever more elaborate and delicate. At the same time, the late medieval period featured complicated headdresses for court ladies, which provided ladies the ability to wear imitation crowns without royal status. Bands like coronets encircled their veils and barbettes. The bands could be wide or narrow, and they gave large scope to the imaginations of the jewelers. The headdresses themselves, made of silk, were beaded with jewels, as were the pins, bands, and nets that held the **hair** tresses in place.

The classic ring brooch remained a common form for these new Gothic jewels. The ring was now elaborately worked in gold and set with smaller gems in pretty patterns, such as flowers or dragons. The brooch's clasp was a pin that fastened on the other side of the ring, as in Anglo-Saxon times. Ring brooches led to heart-shaped brooches and to lobed rings like cloverleafs or flowers.

When a new kind of clasp, called an ouch, was developed, the brooch no longer had to form its own way to catch the pin. New shapes were possible. Wheel brooches kept the ring shape but added gems in a center design held in place with spokes. Brooches could also be in other shapes, such as letters, usually *M* for Mary. Letter brooches were often enameled in bright colors. Cluster brooches could be shaped like a pair of birds or a bunch of flowers, of course heavily covered with gems and pearls. Gems lent themselves well to flowers, since one gem could be the center and the others the petals. **Hunting** motifs and animals, such as stags, dogs, lions, and falcons, were popular with royalty. As the Gothic period went on, brooch designs only grew more fanciful: griffins, unicorns, squirrels, doves, harps, the sun, eagles, swans, gardens, ladies, and even a dromedary.

Heraldic brooches came to function as badges for orders such as the knightly Order of the Garter. The use trickled down to lesser people, whose badges were made of lesser metals. The late Middle Ages had a fashion for livery, a uniform dress for all the servants of a great lord, and badges were often added, particularly in England. The earl of Norfolk's badge was a crowned ostrich feather, while the earl of Warwick had a bear and staff.

Badges could be made cheaply but impressively by using **lead,** gilding the outside to look like pure gold.

Necklaces began as either collars or rosary bead strings. Collars were wide, flat links of gold or silver designs. The links were fashioned as livery for each great lord's household, such as a string of *S* links for Lancaster. (This distinctive pattern is often called a "collar of SS.") French collars were made of links shaped like fleur-de-lis, as well as other shapes such as doves or leaves. The collar lay flat against the wearer's robes and had a pendant with some significant heraldic design, such as an order of knighthood. They were royal honors, not just jewelry, and were only worn by men.

Ladies' collars were more like flat, wide necklaces; they were smaller and fit closer around the neck than the men's and were more heavily jeweled or enameled. Ladies had been wearing beads as rosaries for some time, and the two styles began to blend. During the 15th century, necklaces, like brooches and rings, broke out of the aristocracy and were imitated in less costly style by the upper middle classes. While collars and rosaries both had a central pendant, the new 14th- and 15th-century necklaces could feature pendants prominently as the single ornament. The heart was a popular 15th-century pendant. For the wealthy, they were gold, set with diamonds or pearls. For the townspeople, they were silver or **copper,** perhaps gilded. Crosses were always the most common pendants—jewelry that passed as a mark of the wearer's devotion as well as affluence.

There were new types of jewelry at the close of the Middle Ages. Looser sleeves in the 15th century allowed for bracelets. As with other jewelry, they began as a fashion for royalty, set with pearls and gems. Pendants could be fastened to the new floppy or tall hats to secure the folded liripipe or to enliven plain black beaver.

In the 14th century, metalworkers refined and increased the production of wire. Wire was used in headdresses and jewelry, and it began a trend of plain gold or brass wire rings. Finger rings are ideal pieces of jewelry. They are easily noticed on hands, and they require only small quantities of precious materials. Their simple design allows for many different ways to decorate them. Plain bands can be engraved or decorated with enamel or niello to add colors or black to contrast with gold or silver. The bezel, the raised part on top of a ring, can be engraved or enameled or set with a gem or bead.

Although only aristocrats could wear splendid, large rings, well-off townspeople could afford simple rings made of plainer materials. Common rings were made of pewter, copper, brass, bronze, or even gunmetal. Fine rings, of course, were made of gold or silver or carved from ivory. Metal rings often had gems set in them, as modern rings do. Tiny Roman cameos were favorite ring gemstones. A royal ring made of gold had emeralds, garnets, or sapphires, while a common brass or pewter ring used colored glass to imitate the appearance of real gems.

Brides wore **wedding** rings, and lovers gave rings as gifts. The traditions of courtly love provided the late Middle Ages with ideas for sentimental jewelry. Some 14th- and 15th-century rings had engraved mottoes in Latin or French, such as "Love conquers all," "With all my heart," and "Think of me."

Rings could be the mounts for small **seals,** known as signet rings. They were uncommon before the 15th century. The matrix of the seal could be carved into a gem like onyx, or it could be engraved directly on the gold. It was carved with the intaglio technique so that when it was pressed onto wax, the design stood up from the surface. These rings could be less showy than gemstone rings, but a signet ring implied importance and wealth, so a signet by itself was an impressive piece of jewelry.

Ecclesiastical Jewelry

The Middle Ages had a special class of jewels worn, carried, and used by the rulers of the **church.** Some were adornments of the church itself, such as altarpieces and jeweled crosses. Reliquaries were among the largest, most expensive medieval jewels; they could be as small as a ring box or as large as a closet. Most were about the size of a breadbox. They were usually made as miniature churches or arks.

Abbots, bishops, and archbishops wore a pointed hat called a miter, and it was not only heavily jeweled but also could have brooches pinned to it. Each century, miters grew taller and wider. They were made of silk and were decorated with pearls and gems and embroidered in gold thread. The church's princes also wore copes, small decorative cloaks that required spectacular brooches as clasps. The clasp was called a morse, and it was invariably gold or silver, with gems. The cope itself had gems stitched onto its silk.

Even more importantly, bishops and archbishops wore rings that signified their office. There were episcopal rings, put onto the priest's finger when he was installed in office, and pontifical rings, used only when celebrating High Mass. Pontifical rings fitted over gloves and were only worn on these important ceremonial occasions. They were very large and expensive. Ordinary episcopal rings were hardly modest. The simplest were heavy gold with a gemstone such as an emerald or sapphire. Some had tiny reliquaries built in, with enamel and engraved religious symbols, in addition to gemstones. Bishops were usually buried with an episcopal ring.

Rosary beads were a devout, sedate kind of jewelry. Originally, rosary beads had been made from pressed rose petals grown in a garden dedicated to Mary—a rosary. Over time, rosary beads were made of other materials: bone, coral, pearls, gold, or gems. A rosary had 50 beads on a braided silk string and was worn about the neck. The beads made it easier to count long

repetitions of prayers. The person praying would hold a rosary bead while repeating the prayer and then move to the next bead. As long as his or her fingers didn't slip, there was assurance of counting correctly. They were also called paternoster beads, and some had different-shaped beads to remind the one praying to recite the Paternoster between the common-bead Ave prayer, a salutation to the Virgin Mary.

Reliquaries could be built into rings or necklaces, like modern lockets. Relics could be as tiny as a coiled hair or shard of bone. A really grand rosary set for a bishop would have a small reliquary as its central pendant. Reliquaries like this could be good excuses for nuns and priests to wear jewelry, which otherwise would be considered too worldly.

Most priests and nuns were both permitted and expected to wear crosses. Crosses, of course, could be made of simple wood, but, with time and increasing donations, most clerics wore elaborate crosses. They could be reliquaries, of course, especially if the relic was a supposed shard of the True Cross itself, but crosses needed no excuse to be large and gem encrusted. Medieval crosses, whether carried on a staff or hung about the neck, are among the most stunning, elaborate, and showy pieces ever made.

Saints inspired devotional jewelry. Goldsmiths and other metalworkers made tiny images of saints like Saint Christopher for travelers and Saint George for soldiers. Saints' images could hang on a chain. There were also diptych pendants, similar to modern lockets. Two hinged panels clipped shut for wear on a chain but opened to show an engraved or enameled scene of a saint's life. Even simpler, pewter or lead **pilgrim** badges were religious souvenirs sold at saints' shrines. They were mass-produced with a mold, and pilgrims collected them as they traveled. They could fasten them to their hats or cloaks.

See also: Clothing, Gold and Silver, Hair, Hats, Magic, Relics, Weddings.

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Jews

Jews were the largest minority ethnic group in medieval Europe. For the most part, Jews led normal lives in Europe. Their lives were more similar to their **Muslim** or Christian neighbors than to each other to the extent that climate and work shape a family's life. Still, there were ways in which they differed, not only in religion and **holidays.** Their traditions of education, government, and family law were not the same as their neighbors'. The Hebrew language was a powerful bond tying Jews in all parts of Europe into a common identity.

The earliest Jewish communities in Europe were in Italy, Spain, and Germany under Roman rule. Cologne, established as a Roman colony, had a Jewish population, living as farmers and wine producers, from the 3rd and 4th centuries. Spain's Jews, before the Muslim conquest, also lived as poor farmers. Muslim Spain honored Jews as physicians, scholars, and administrators. In Germany, most **cities** had significant Jewish populations by the 11th century. Jews migrated to England and France and also became established as small farmers, craftsmen, and merchants. Spain became known in Hebrew as *Sefarad,* and Germany was *Ashkenaz,* two words still used to distinguish Spanish or Arabic Jews from Northern European Jews.

Two medieval Jews in Germany had unusual careers. A Jew named Isaac, who lived in Aachen, went to Baghdad on a mission from Charlemagne. His fellow ambassadors died on the journey, and he became both survivor and leader. His most famous task was finding a way to escort a white elephant over the Alps, along with the many other rich gifts from Caliph Harun al-Rashid. Later, in the 14th century, Süsskind von Trimberg was one of the Minnesingers, the German **troubadours.** He traveled like a Christian **minstrel** until he was forced to wear a distinctive Jewish badge.

Many European cities had a Jewish Quarter, a voluntary neighborhood cluster of Jewish artisans and merchants. The location became less voluntary and more restrictive as Europeans became more prejudiced against Jews. Then Jews lived in the Jewish Quarter because they were legally required to live there.

Jewish men wore full, untrimmed beards that made them look different from their Christian neighbors. In 1215, the Fourth Lateran Council declared that Jews and Muslims must also wear distinctive **clothing** or a badge. The distinctive badge varied from place to place. The most common was a flat, funnel-shaped **hat** with a tall point. Some medieval illustrations of Bible scenes with Abraham or Moses show the patriarchs wearing these Jewish hats. In other places, they wore a yellow stripe or a square yellow hat. During the 14th century, at the height of anti-Jewish prejudice, some places required Jews to wear a red and white circle on their chest. After the

Jews were officially viewed as foreigners, even if their families had lived in the town for many generations. Unless they converted to Christianity, they were in a special class of people with foreign loyalties who needed to be watched. After the Fourth Lateran Council of 1215, Jews in Europe were required to wear badges to prevent them from blending in. Pointed hats and yellow badges, shown here in a 14th-century Bible illustration, were the typical French requirement. (Isadore Singer, ed., *The Jewish Encyclopedia*, 1901)

close of the Middle Ages, the most common badge became a yellow ring stitched to their cloaks.

Houses

Jewish **houses** were similar to Christian European houses, but there were some distinct differences. The home was the center of Jewish religious observance, even more than the synagogue. To some extent, Jews fit into the culture they were in: in Muslim Spain, their houses had beds on the floor, while they had wooden platform beds in Germany. In Spain, the most important function of the **garden** was to have a cooling fountain; in France, it was to have an adequate well and privy. In Spain, they often had separate sleeping and dining rooms, but in the small houses of France and Germany, they slept in one room and ate in the kitchen. Jewish homes in Spain often had small water **clocks** by the 13th century, and there were prominent Jewish clock makers in the Arabic water-clock tradition. There was a greater tendency for Jews to build houses of **stone** in cities where Christian houses were still typically wooden.

There were a few key differences that crossed all regions. Every Jewish house had a miniature Torah scroll called a *mezuzah* mounted in a special case on the right-hand doorpost. It contained some lines from the law and

was specially made by a professional scribe. Women lit oil lamps or candles just before sunset on the Sabbath. Every Jewish home also had a decorative cup for the ritual blessing of wine on the Sabbath.

Jews had to pay attention to religious rules for washing and food preparation. Next to the bed, there was always a pitcher and basin so they could wash their hands immediately on waking. Jews were required to do much more washing and were more likely than Christians to own wooden bathtubs.

Jewish cooks had to follow the dietary rules known as *kashrut,* or kosher. This meant keeping meat and milk separate in all parts of the **kitchen** and in all dishes. They did not eat pork, the most common meat of Christian Europe. They also had to cook an extra meal on Friday and keep it hot in the coals until noon on Saturday, the Sabbath, since no new fires could be lit that day. In Spain, this meal was a vegetable and chickpea dish called *adafina,* while in Northern Europe it was a meat stew called *cholent,* perhaps from the medieval French word for "hot."

Jewish Communities

The first priority of a Jewish community in a European town was to maintain a public bath for their ritual washing needs. This bath was called a *mikveh.* Ritual washing required the whole body to be wet and used running **water** if possible. Minority communities did their best to provide this, from a reserved bit of lake shore to a public bath in town. The second priority was to organize a **school,** since prayers, the function of a synagogue, could be offered at home. Many Jewish communities also put a lot of effort into maintaining a **library.** The next priority was a rabbinical court to settle disputes of family law, such as marriage and inheritance.

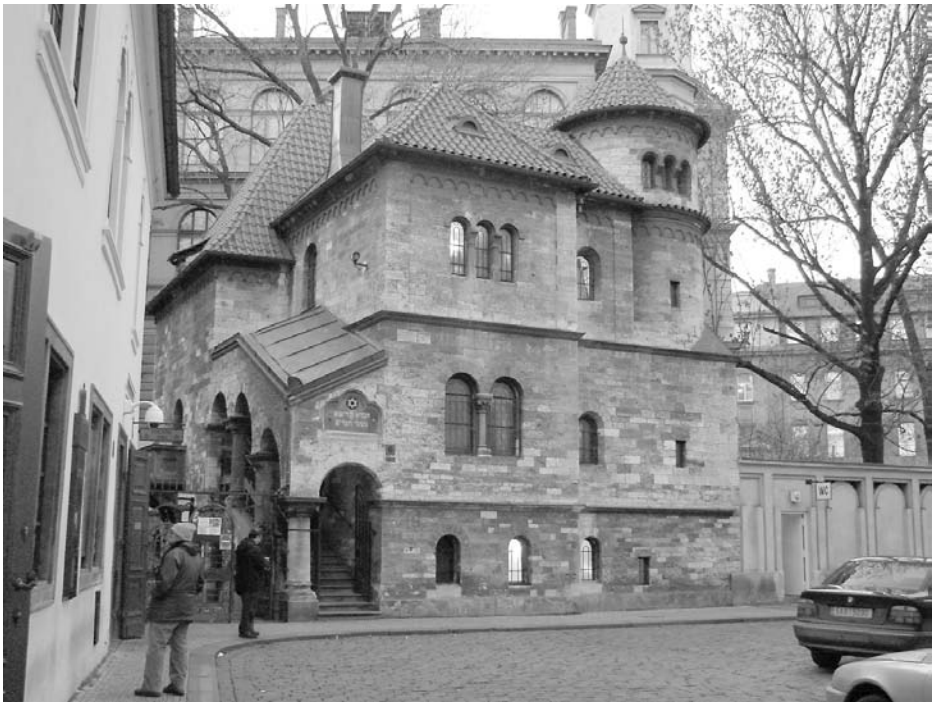
Other community functions in the Jewish Quarter could include a communal kitchen, for making the large amount of food needed for a **wedding** or holiday, or a hall to meet in. Especially in Germany, many Jewish communities owned a hall for dances and weddings. There were **inns** for Jewish visitors in the larger communities. In Muslim Spain, Jews had **hospitals,** in addition to hospice care for the poor. Many Jews had been trained as surgeons and physicians. Finally, a Jewish community tried to provide its own cemetery.

Synagogues in Europe were similar to Christian buildings in their basic aspects, such as a meeting room and high windows, often with **glass,** for light**.** But they were not richly decorated, as Christian churches always were. In Muslim Spain, synagogues were fairly secure, but in Northern Europe, there was always a chance that a later medieval Christian mob could decide to vandalize a synagogue. For this reason, they were kept simple and dark and were not filled with overt signs of the building's purpose. Christian

regulations did not permit them to be built as tall as the local church. Even large, elaborate medieval synagogues were small and simple in comparison with churches.

The chief possession of a synagogue was its copy of the law, the Torah scroll. In Europe, this was kept in a built-in structure called an ark, but in Muslim Spain, it was usually kept in a movable case. Both kinds were elaborately and expensively decorated. The scroll itself was also expensively decorated with **gold** and **silver** ornaments on the wooden rods that held the scrolls. The next most important mark of a medieval synagogue was an oil lamp kept burning at all times, in memory of the eternal flame of the old temple in Jerusalem. Wealthy European synagogues also kept a large candelabra, the *menorah,* next to the Torah ark.

Synagogues had a central reading desk and lectern, with styles varying regionally. In Spain, the lectern was elevated with a canopy over it, as in a mosque. Seating options varied; in Muslim regions, there was often no seating, and women stood with men. In Italy, some synagogues provided individual desks for the congregation, and most European synagogues at least had benches. In these synagogues, women had an upper gallery or a separate annex.



The Old-New Synagogue of Prague was completed in 1270. There is a Hebrew inscription with a Star of David over the main door. (Jim Milles)

The Middle Ages were a very active period in the intellectual life of Judaism. At a time when most Jews were anonymous in the larger Christian culture, rabbis like Gershom ben Judah of Mainz (10th century) and Solomon ben Isaac (known as "Rashi") of Troyes (11th century) wrote very influential interpretations of Jewish law. Medieval Jewish writings were concerned with how to interpret Jewish law for people living in non-Jewish societies outside Israel.

The rabbinical structure also provided for Jews to be self-governing to a high degree. They followed not only the laws of the outside community, but also their own restrictive laws concerning diet and daily life. They had their own court system to deal with disputes over Jewish regulations and family matters such as marriages and adoption. They could impose fines as well as banishment from their community. In Spain, Muslim rule gave them further power to impose corporal and even capital punishment.

During the Middle Ages, the rabbinical courts developed a system of ruling by probability. Probability was not yet a field of mathematics and was not applied even loosely to the secular use of **games** of chance. Rabbis were often faced with dilemmas concerning cases with inadequate witnesses or facts that could not be established. They created a method of estimating the probability of the facts being one way or another way and calculated which scenario was most likely. They ruled that the most likely situation was the truth. Although their study of probability did not extend into a modern level of complexity, they wrote rules for discovering the probability of a case that had several factors, each with its own probability.

Women

Jews had their own distinctive marriage customs. Like medieval Christians, they celebrated weddings in public so that everyone knew the wedding had taken place, but the ceremony was not considered a religious rite. Jewish weddings traditionally had a great deal of **music** and dancing, more than Christian wedding feasts at the same time. Their children were married younger than Christian children, since Jewish law considered girls adults at 12 and boys at 13. A typical medieval Jewish bride and groom were not much older than 12 and 14, although they were not expected to begin living as an independent married couple at that time. Jewish law also permitted a husband to marry a second wife, but the practice continued only in Muslim Spain.

The Sabbath prior to the ceremony, the bride was carried on a throne into the synagogue, as a public announcement of the intended wedding. On the wedding day, the bride and groom were conducted separately to a public location, usually outdoors but sometimes in a hall, where they stood under a canopy made of a prayer shawl (*tallit*). The groom placed a ring on

the bride's finger, and the rabbi blessed them. The groom gave the bride a sip of wine from a special cup. Jewish brides in medieval Germany were the first to wear white, which was the color of mourning, in memory of the destruction of Jerusalem. Jews in Germany sometimes threw grains of wheat on the couple with wishes for fertility.

Wives had rights under Jewish law that they did not have under Christian law. It was against the law for a Jewish wife to become poorer or in any way worse off by marrying. A husband could not compel her to move into a worse house or town, unless it was in Israel itself. The wife herself had the right to compel her husband to move to Israel, which was considered a blessing even if they were poor there. Some marriage contracts stipulated that husbands must buy wives a certain quota of new clothes or **jewelry.** If she owned property before marriage, it remained hers, unlike in Christian law.

Medieval European rabbis like Gershom ben Judah also increased the wife's rights in divorce. At a time when the Catholic Church was making it virtually impossible for married couples to divorce, Jews were permitted to divorce if the husband gave the wife a certificate, called a *get*. Divorce was still rare in the Jewish community, but a Jewish wife could both refuse and demand a divorce. She could choose to divorce a man for making her life materially worse or for wanting to move to a place she didn't like. If she had been married before the age of 12 to a man she didn't like, she could refuse to remain his wife once she was considered an adult by Jewish law.

In Muslim Spain, Jewish **women** had equal rights with men and could own property or engage in commerce on their own initiative. In Christian Europe, Jewish women often worked in their husbands' businesses but did not usually trade on their own. In some cases, they carried out most of the business so their husbands could complete rabbinical studies. They also worked in the same home crafts that Christian women did; they spun, wove, and sewed and could sell these products.

Most girls did not learn Hebrew or study the Jewish law, but some did. There are medieval letters in Hebrew written by women, and many learned the prayers. Many more were familiar with the Hebrew **alphabet.** Yiddish first developed during the Middle Ages as a way for uneducated Jews, such as women, to write. It used Hebrew letters to write medieval German, with some borrowed Hebrew words. Early Yiddish **books** explained to women how to keep the holidays correctly. They also told popular medieval stories, such as the legends of **King Arthur.**

School

In Christian Europe, Jewish families taught their children at home or organized synagogue schools. Their children did not attend Christian Latin

schools and often did not learn Latin at all. In Muslim Spain, Jewish children attended Islamic schools. They were educated in Arabic and in the Koran and studied Hebrew and rabbinical matters on the side. Since they were part of a system of schooling within the culture, they tended to stay in school longer, until age 18. Children in Jewish families were less likely to work than in Christian families, where learning a trade and helping in the family's trade were assumed. A boy's first responsibility was education, not work.

A Jewish boy began school around the age of six, with a new student ceremony. He was dressed up and carried into the synagogue by his father or a teacher. They gave him a wooden slate with the first and last letters of the Hebrew alphabet and an inscription that Moses had commanded to learn the Torah (the Jewish law). They put drops of honey on the tablet and let the child lick it off to teach him that learning was sweet. After this, the boys had to go to school for the same long school days that their slightly older Christian peers endured—from dawn to about six in the evening.

Jewish boys in both Christian Europe and Muslim Spain studied the Hebrew language and Jewish law. They were considered responsible for carrying out the law themselves, so the knowledge was not left to certain scholars among them. The most promising students went away from home to a *yeshiva,* a Hebrew studies school, to complete rabbinical training. Even then, they did not become rabbis. The title of rabbi was reserved for those who spent a lifetime learning not only the law and its commentaries, but also all of the rabbinical commentaries up through the present, a body of work that grew continually. In Spain, a Jewish boy who continued his studies past the basic level became an expert in Arabic composition, and many of these writers and poets tried to improve the state of composition in Hebrew, a closely related language. Medieval Muslim Spain and its network of communities in North Africa and Egypt became a powerhouse of Hebrew poetry.

Practical education was whatever training was needed for the family's line of business. Jewish boys could not enter Christian **guilds,** but in some cases they served apprenticeships for a trade. They learned arithmetic and accounting and whatever languages were additionally needed, such as Arabic or Latin. Among Jews, business contracts and letters were written in Hebrew.

Work

Normal education for Jewish boys included the basics of medieval **medicine,** which pushed a high percentage of Jewish men into the medical profession. This was especially true in Spain, and books by these learned Jewish doctors became standard texts. In Christian Spain, most kings had a Jewish

physician, but in northern countries like France and England, Jews were not permitted to practice medicine, nor were they admitted to medical schools. Christian medical students, on the other hand, were not permitted to study surgery, while the medical tradition in Spain emphasized surgery. Jewish surgeons taught at Spanish medical schools, and there may have been some Jewish medical schools in Spain and Provence.

When Jews first came into Europe, they were farmers, like most peasants. Many continued to farm throughout the Middle Ages, even if only on a small scale to supply the Jewish community with kosher food. Many in Italy and France also owned vineyards and produced kosher wine. When Jews farmed, they most often owned their land, instead of holding it in fief from a Christian overlord. As prejudice against them increased in the 12th century, in some places they were barred from owning land, which pushed them more into commerce and banking.

Many Jews were involved in international trade; among other advantages, they used a common trade language, Hebrew, and often knew several other languages. Frankish kings, including Charlemagne, granted trade privileges to Jews to induce them to come and bring their import business. In Sicily, they were granted a monopoly on silk dyeing, and they were silk weavers in many places. In Spain, they had a monopoly on red kermes dye. The Jews of Barcelona and Majorca, two major Spanish trading hubs, were almost entirely employed in commerce, much of it for silk or fine ceramics. Jewish merchants became such an integral part of some international **fairs** that the organizers shifted the schedule to avoid the Jewish Sabbath.

Jewish law did not permit Jews to lend money at interest to their Jewish relatives, but they were permitted to lend to foreigners. Since Catholic law also outlawed charging interest on loans, one important role of Jews in medieval Europe was to lend money at interest. Being creditors to powerful Christian princes and merchants was dangerous for Jews, and it increased prejudice against them. Jewish traders further developed some of the methods of modern finance, such as letters of credit and checks, written in Arabic or Hebrew.

Jews were excluded from Christian guilds, but they still learned trades. Especially under Muslim rule, they were permitted to work in any trade. Around the Mediterranean, they worked in **glass, copper,** leather tanning, shoe making, and weaving silk. They made fine instruments such as **clocks, astrolabes,** and **jewelry.** In some places, Jews minted **coins.**

Persecution

The medieval Catholic **Church** made official proclamations that Jews needed to convert, but Popes routinely issued orders that Jews must be safe from harassment. Although folk belief came to blame killing Christ on

Jews, official doctrine in the Roman Catholic Church did not make these proclamations. During the early Middle Ages, there were no significant persecutions or legal discrimination. Even during the period of European anti-Jewish prejudice, many local Jews and Christians lived and worked together. There are records of Jews and Christians in joint partnerships, apprenticeships, and gift exchanges. Jews and Muslims in Spain, and then Jews and Spanish Christians, were also normally on very good terms. Most Jews lived peacefully, if overtaxed. However, they were also the group most singled out for mob violence, especially after the 12th century.

Anti-Jewish feeling in Europe may have begun in the 12th century by associating the Jews with the Saracens, who were rumored to have destroyed the Church of the Holy Sepulcher in Jerusalem. The First **Crusade** sent an army overland through Germany and Hungary in 1096, and it included a number of criminals who had been pardoned if they would fight for the Holy Land. Part of this army attacked Jews around Mainz and Cologne, although local rulers attempted to protect the Jewish community. Again, in 1236, Crusaders in France massacred as many as 2,000 Jews. The Jews may have seemed like foreigners or unbelievers to these mobs.

Jews were subject to discriminatory taxes in all parts of Europe. Under the Muslims, they paid the *jizya* tax as non-Muslims. In some Muslim cities, they shouldered a large part of the tax burden, in addition to supporting their own communities. Christian rulers not only taxed them, but also borrowed from them and then defaulted on the loans. To fund the Crusades, several kings forced Jews to lend large sums to them, never to be repaid. The usual way to default on such loans was to expel all Jews, requiring them to leave all property behind, forfeit to the Crown.

When Jews traveled, they were special targets for robbery and kidnapping. If they dressed as Christians, they were safer. If they were known as Jews, even Christians who were not robbers as a full-time profession would consider stealing their merchandise.

Spain was a refuge for most of the Middle Ages, but not always. The Umayyad emirs and caliphs had been relatively secular and easygoing; under them, the "Sefara"—the Jewish community—had its Golden Age. By the 12th century, civil war had permitted a large influx of North African Berber rulers. The Almohad dynasty was puritanical and tried to reform the lax ways of previous Muslim rulers. Jews were not protected or treated well, and many left Spain. The most famous medieval Jew, Moses Maimonides (in Arabic, Musa ibn Maymun), was born into a prominent Jewish family in Cordoba in 1135. The Maimon family left Andalusia and went to Egypt. They were treated with discrimination in Egypt, too, which pushed Moses to look harder at his neglected Jewish heritage. Like many well-educated Arabic Jews, he worked as a doctor in Alexandria. He became one of the best-known commentators and philosophers, both within Judaism

and across Europe. His philosophical writings, in Arabic, influenced European study of Aristotle and Plato.

Conditions in Northern Europe also became less hospitable. England and France went through times of expelling and then recalling the Jews. Jews were chronically put under heavy, discriminatory taxes, and their estates could be confiscated at death on the grounds that they had obtained their wealth sinfully. According to popular rumor, they were accused of killing Christian children. The first documented rumor began in 1144 when a boy was found murdered in Norwich, England, and the people accused the Jews. The boy became Saint William of Norwich. After this, Jews were often accused when a child's body was found dead; just as often, a mob murdered some Jews in retaliation.

In England, the Plantagenet kings had declared that Jews were the king's property and must serve him. The Jews of York were massacred on the day of Richard I's coronation because a small number of them were traveling to London to present gifts, and a rumor spread that they were dangerous. The Jewish community was then forced to come up with much of the ransom money when Richard I was held captive in France. King Henry III forbade Jews from accepting land as security for loans in 1269; Edward I prohibited them from charging interest in 1275. In 1290, Edward I forced the Jews to leave England. They left behind all their money and property and went penniless to France.

In France, King Philip II had confiscated a great deal of Jewish money in 1180 and then expelled the Jews. He invited them back a few years later, in 1198. King Louis IX, the Crusader, publicly burned a copy of the Talmud and repeatedly confiscated Jewish property. In 1246, he had the Jews of Carcassone imprisoned until they could come up with a large enough ransom. The Shepherds' Crusade of 1320, led by out-of-work and starving shepherds, led to widespread massacres of Jews all over France.

There had been an active, relatively free Jewish community in the county of Champagne. They were involved as bankers and merchants in the successful Champagne fairs. When Countess Joan of Navarre married King Philip the Fair of France in 1284, the county of Champagne was no longer independent. The fairs began to fail as the French king imposed high taxes on all transactions. In 1306, he expelled all Jews. Jews were still in southern France, in the county of Toulouse, and in Germany. Germany had been a relatively safe place for Jews.

The last blow to Northern Europe's Jewish communities was the Black Death **plague.** The first outbreak in 1347, beginning in Italy and southern France, was fast and severe. As much as half the population died in many regions. It spread by an unknown means, and it killed people very quickly. Nobody knew why it was happening, and many blamed the Jews, among other scapegoats.

Even without a solid reason for blaming the Jews, a mob in a village near Marseille attacked the Jewish population on Palm Sunday. They smashed property, burned houses, and left 40 Jews dead in the street. The nearby villages began to follow, and many Jews were burned to death. In some villages, no Jews were left alive. The city of Marseille itself did not join in these mob activities, and Marseille's Jews survived.

As 1347 passed, there were increasing accusations that Jews had poisoned the water supply. In September 1348, a Jewish doctor living near Lake Geneva confessed, probably under torture, that he had imported **poison,** passed it around the Jewish community, and used it to poison wells. He led his interrogators to the spring he had supposedly poisoned and named conspirators. Many other Jews were interrogated and tortured. The actual poison was never found, but people believed it was made of reptiles or Christian hearts. The rumors passed quickly through Europe. Mobs took over and, in fear and anger, began killing Jews. The Jews of Narbonne and Carcassone, in southern France, were executed by mobs. The Jews of Basel, Switzerland, were herded into a wooden building and burned. All over Germany, Jews were attacked and often burned.

The Pope, the king of Aragon, the king of Germany, the duke of Austria, and the town elders of Cologne, Germany, all tried to stop the massacres. Although they could protect some Jews in their localities, they were not able to stop a mass of people who were terrified of the horrible plague around them. After the plague waned, the attacks stopped, but many people still thought Jews had poisoned the wells. Most of Northern Europe's surviving Jews went to the kingdom of Poland, where they were safe until modern times.

As the Christian Reconquest of Spain pushed south, Spain became even less of a refuge for Jews. More of them left and went to North Africa, Palestine, Italy, and even Northern Europe. A significant Jewish community remained in Spain until the final victory of King Ferdinand and Queen Isabella over the last Sultan at Granada. They expelled all remaining Jews.

See also: Alphabet, Banks, Crusades, Medicine, Muslims, Plague.

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K

Keys. *See* Locks and Keys

Kitchen Utensils

Medieval cooks fell into two categories, like modern cooks. There were amateur cooks for a family, usually the wife or mother, and there were professional cooks. Professional cooks for large-scale households, such as **castles,** were usually men, but there must have been many smaller **houses** that hired female cooks who had started not as apprenticed professionals but as amateur cooks in a home. The amateur cook's equipment varied tremendously from cottage to city house. Professional cooks had a reasonably standard set of equipment, and large kitchens in the late Middle Ages were well equipped, even with running water and floor drains.

The cooks' **guilds** had high standards and tried to enforce them. Professional cooks, in their treatises on the craft, emphasized the absolute necessity of keeping all surfaces and utensils spotlessly clean. Cooks, too, were supposed to be clean, with short, clean fingernails and clean hands and clothes. Cooks in illustrations sometimes wear linen aprons or towels to cover their clothes. Unfortunately, it required stern management to enforce these rules in a real kitchen. The kitchen of a large household was a hot place, with fires blazing even in summer. The cook and his helpers grew sweaty and dirty from soot, dirt on vegetables, and blood from the meat they were cutting. Their clothes and hands were often dirty. In the *Canterbury Tales,* Chaucer's Cook has an open sore on his leg. Cooks were also viewed by the general public as tricksters who would pass off dirty or spoiled food if they could.

A cottage kitchen had only the most minimal utensils. Every cook needed a metal pot, either brass or iron, with a lid. The basic cauldron had three legs and two handles, and it could be hung by hooks and chains from a beam. Until smiths could make cast **iron** pots, these cauldrons were probably usually **copper** alloys, brass or bronze. They were a major investment for a poor household, and when they finally cracked, they were often mended by itinerant tinkers or coppersmiths in town. Another basic pot was an open, wide pan for frying. A turning spit was needed if the family ever had a piece of meat to roast. The simplest cottage bread, a flat lump, could be baked on a flat stone with coals heaped over an overturned pan or lid above it. Every cook needed stirring and ladling utensils, and the simplest were home carved out of wood. Knives were the most important handheld utensils.

Even simple kitchens that supported a milk-giving goat, sheep, or cow had to deal with making products out of the milk before it spoiled. Butter churns were made like **barrels,** by coopers, as were cheese tubs and

buckets. Dairy equipment included cloth bags or rush baskets to drain the cheese curds. Cheese rounds were wrapped and stored on shelves to cure. Small wooden bowls and tubs of butter could be stored on the same shelves, in a cool place.

Cottagers did not have many eating utensils. Their bowls were carved from wood or, in more prosperous times, turned on a lathe. Both cups and bowls could be fired pottery, either glazed or unglazed. Spoons were carved from wood or cast in pewter. Most eating was done with hands or with bread crusts to scrape out stew or pottage.

Bakers were usually a separate profession, since ovens that provided steady heat to surround a pan were not easy to make or maintain. Bakers' ovens were shaped like beehives, and bakers used long-handled trays to set round breads (and even pretzels) in and out of the oven's shelf. When baking was part of a large permanent kitchen, such as in a castle or royal household, the ovens were housed in a separate building.

Professional cooks in the late Middle Ages could be hired as caterers for an event, such as a wedding feast for a family whose daily facilities were not large enough or for a guildhall's annual feast. The professional cook and his staff (which included not only sous chefs but water boys) also needed rented kitchen utensils. They needed iron pans, wooden mixing bowls and spoons, and large ceramic pots for making pottage or mixing wine. The rented or borrowed utensils also included wooden buckets, brooms, and washing tubs to clean the place before and after. These lists probably assumed that the kitchen, as it was, came with several cauldrons, saucepans, and griddles and at least one turning spit.

A well-provisioned, permanent kitchen in the late Middle Ages, such as in a castle, manor, or abbey, had far more tools and amenities than a cottage kitchen. It had water pipes with taps, a basin to catch the runoff, and drains to carry it away. It had a floor drain to catch liquid slops and keep the floor from becoming slick. There were rags, towels, and cloth sacks, as well as soap and brushes. Kitchens also needed stockpiles of wood or charcoal and a supply of candles.

The fireplace, invented in the 13th century, revolutionized the room's layout. Tables could fill the main floor space, since there was no central fire pit. There was always at least one dormant table—that is, a permanent table with fixed legs, sturdy enough for all work. For unusually large cooking events, trestle tables could be set up in other parts of the room so that extra hands could be chopping and stirring. Large kitchens also had stools, since many tasks required someone to stand or sit, stirring a pot, for a long time. A stool was often near one of the fireplaces, since a kitchen boy had to stand nearby and stir or turn the food as it boiled or roasted. By the fireplace, there was always at least one bellows for blowing the fire hotter, and large kitchens had more than one. The fireplace came with andirons—the

rack that held the wood and could support a spit. It also required fire irons (rakes, pokers, shovels, and tongs), turning spits, hooks and chains to hang cauldrons over the fire, and trivets or spiders to set pots on in the coals. Most cooks also had fire pans or fire baskets to carry burning coals.

The cauldrons used in the large fireplace could be very tall. Illustrations of medieval cauldrons in use show tall, narrow vessels shaped more like urns or vases clustered together with fire built up between them. Cauldrons could also be wide and often had feet. They were made of iron or brass. Large kitchens had 6 to 10 cauldrons of different sizes. Additionally, they had saucepans, frying pans, griddles, and chafing dishes made of iron or brass.

Cauldrons and pots required attending utensils. Skimmers were usually made of iron; they had wide, shallow bowls pierced with holes, and they skimmed foam from stews. Flesh hooks were very important utensils for a medieval cook, since so many meat dishes were made with pieces of meat boiled in pots. They had long handles and sharp tines, like a rake's, that turned. Cooks often needed to drain or strain their foods, so they had colanders made of copper or brass. There were also graters, sieves, slotted spoons, ladles, rolling pins, long forks, and tongs. In Italy, cooks needed drying racks for freshly made pasta. The best cooks also used pastry tubes, brushes, needles, and many other fine or unusual tools to achieve the results of appearance and shape needed to astonish the guests.

There were ceramic pots with lids that could be set in the fire's ashes with coals heaped over the lid. Many bean dishes were baked this way.

Early kitchens, whether simple or sophisticated, were necessarily centered on the fire. By the late Middle Ages, the fire was more often located in a hearth with a chimney built into the wall, allowing more open space in the room. A well-equipped fire had racks, hooks, and spits. Here, a boy turns a roasting spit so that the meat will not burn, while an older man tends some covered ceramic pots that have been set very close to the fire. Spoons in various sizes hang against the wall, a pitcher and a grater sit on a nearby table, and a fellow servant enters carrying a lantern, another basic kitchen need. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

Cooks needed pie dishes made of pottery, tin, or brass. To mix spices and grind herbs, every kitchen needed a stone mortar and pestle, and sometimes a slab of marble, as well, for finer grinding. They also used wooden spoons and spatulas and wooden mixing bowls, either carved and lathed from a single block of wood or in the form of a coopered tub, basin, or trough. Every kitchen also had barrels and casks to store raw materials, from flour to apples. They also needed wicker baskets for carrying just about anything from barn or pantry to kitchen.

Cooks used specialty knives including cleavers and paring knives. There was an array of serving dishes made of pewter, brass, bronze, and ceramic. Many flagons, pitchers, and ewers were made of pewter or latten (a name for various cheap metal alloys). Cooks used pewter vinegar pots and pewter saltcellars. Salt boxes for table use were decorative and functioned as centerpieces. Flagons brought ale and wine to the table, while ewers carried washing water to diners. Ewers had feet, as well as a handle and a pouring spout. Kitchens needed pewter, bronze, or latten basins to catch the wastewater, and these were kept in pairs with the ewers. Every diner needed a pewter spoon; the spoons were carefully collected and counted following a feast.

See also: Barrels and Buckets, Food, Guilds, Houses, Lead and Copper.

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Knights

The concept of the knight in armor is central to our modern idea of medieval Europe. The French word for a knight, *chevalier,* meant horseman, and a knight was first and foremost a mounted warrior. The life of a knight, from boy to squire to knight to lord, was a long training schedule to create a specialist warrior. Knights were the special forces of the Middle Ages. Kings supported them by granting them rights to land, castles, and fairs; they lived on rent and other profits. In return for their freedom from milling or farming like other men, they spent their time training and keeping

up their equipment. They were committed to assemble for any war that their lord demanded and to give their lives without hesitation.

Charlemagne was probably the first European king to use mounted warriors. His warriors were noblemen who owned enough land to support horses, but they did not yet live in fortified houses. Since poorer men did not have horses and could only be foot soldiers, riding a horse in battle quickly became a mark of distinction. Poorer men who had to work in the fields were not as likely to learn to ride well, so the ability to ride a horse also implied wealth and leisure. Mounted warfare became a mark of the privileged class, and it remained so for many centuries.

Horses were relatively new in Europe in Charlemagne's time. During the eighth and ninth centuries, the development of iron horseshoes allowed horses to travel over rough ground with less hoof damage. Saddles began to use stirrups, allowing the rider more control over his movement and the horse's. In the same period, changes in farming permitted fields to raise an extra crop of oats, which helped support horses for work and war. Horses also required acres of grazing land.

The real development of the knight began after 1000. In the heart of Europe—modern France and Germany—the central power of Charlemagne's kingdom had broken down. Although there was a French king, he controlled only a relatively small territory. Regional counts and dukes ruled most of the territory as vassals of either France or England. The counts and dukes built castles and needed warriors to create very mobile, flexible standing armies. They needed fighters mounted on horses, highly trained and both free and willing to fight for any cause. These fighters were loyal only to the local authority structure—to the count of Anjou or Toulouse or to the duke of Burgundy. They owed their income and prestige to their lord and were often rewarded with land and houses. Over the course of the 11th and 12th centuries, these fighters evolved into the familiar figure of the medieval knight. The knight had his own weapons, customs, rank, and code of conduct, set apart from other parts of society.

A change in inheritance laws made possible the golden age of the knight. Until around 1000, a landowner could subdivide his land among his children or give part of it to the church at his death. So much land was given to the church that families in France and Germany became too impoverished to fulfill their duty of military service. The new law of primogeniture gave the land to the oldest son to carry on the family dynasty and gave little or nothing to younger sons because the land was no longer partible. The older sons became the ruling barons who trained and supported knights. The younger sons, who trained for knighthood but owned no more than their horses and equipment, fought with little to lose and much to gain. They attached themselves to ruling knights as little more than mercenaries. Many

of them received manors and castles from kings as rewards or were able to marry rich heiresses. Many more died in battle.

In northern Italy, where society followed different patterns of settlement and government, knights never became central; the military backbone was always the citizen militia. Southern Italy was dominated by Normans and was therefore more feudal. Norman knights also fought in Spain and brought their ideals to the Christian kingdoms.

During the 11th and 12th centuries, the church promoted pacifist ideas to protect the common people of Europe. Knights too often pillaged the countryside, attacked unarmed bystanders, or took part in wars against neighbors. The Peace of God, a doctrine that unarmed people must not be attacked, evolved into the Truce of God, a doctrine in which fighting was not permitted during certain holy seasons or on certain feast or fast days. Knights took oaths to protect, not harm, the helpless and to obey the church's rules for war. These oaths, and the code of conduct they promised, became an integral part of the concept of a knight.

Edward, son of King Edward III of England, was one of the leading knights of the Middle Ages. He died before he could inherit his father's crown, but during his lifetime he led a number of famous military campaigns. He was the commander at the decisive English victories of Crécy and Poitiers in the Hundred Years' War. When he captured the king of France and his son at Poitiers, he treated them with great respect, according to the rules of chivalry. He became known to history as the "Black Prince," perhaps for a black suit of armor, and his effigy remains one of the best-known symbols of knighthood. (Steve Vidler/StockphotoPro)

The fact that a knight's job was to kill posed a problem for the church. Knights were honored in society, and they were patrons of churches. Germanic society had always been comfortable with warrior values, but, as the Christian religion became a deeper part of that society, the church had to address the sinfulness of the knight's primary activity. One means was to recruit knights for the Crusades, which began in 1095. It seemed less sinful to kill those who threatened the access of Christian pilgrims to Jerusalem. Another means was the creation of tournaments, war games in which deaths were only accidental. However, the church did not approve of tournaments, since they still promoted worldly pride and often caused deaths. The third means was the investiture of the knight's life with religious symbolism and meaning through the creation of the code of chivalry.

Chivalry based its rules first on the knight's duty to defend the people he had promised to defend. To run away or give up was unacceptable; knights fought to the death or until they were captured and disarmed. The Peace of God duty not to kill the unarmed was another side of this rule, since the knight was supposed to protect the unarmed inhabitants of his lord's territory. The church hoped to keep society civil by expecting knights to extend this duty to all unarmed people, especially those who were unable to fight. Monks, women, children, and the very old or sick were unable to fight, and a knight was to consider it his duty to protect them if they needed it.

Chivalry also required a knight to be loyal to his lord and to his fellow knights. Loyalty was not always simple, since the same man could be a vassal of different kings for different estates he held. A knight was not supposed to seek individual glory at the expense of his fellow band of knights. A knight without ties of loyalty was called a knight errant—a wandering knight.

The rules of chivalry did not require kind or generous conduct on the battlefield. Knights still killed as mercilessly as they were able to. However, if they took a prisoner, they were not to kill him without need. Prisoners were to be treated well and ransomed. This put a limit on the barbarity of behavior in war, and it assured noblemen that they did not have to fear capture in war, even if they feared the dishonor that capture brought. The code of conduct did not prevent knights from killing ordinary bowmen or foot soldiers they captured.

By the 14th and 15th centuries, the chivalric ideal of the knight was more popular than ever, but wars were no longer dominated by knights. Wealthy knights focused on expensive plate armor and performance at tournaments. While some still took part in war, the lesser nobility increasingly paid a cash equivalent to personal service. The king used this money to hire foreign mercenaries of low birth who came equipped with crossbows and pikes. War continued to be as lawless and gory as ever, while the ideals of chivalry rose higher and higher.

The development of arms that did not need as much specialized training but were very effective against mounted knights made knighthood obsolete as a practical military force. Gunpowder first created cannons capable of breaking sieges, but soon after, gun makers created small arms that required minimal training and had none of the art and beauty of the knight's weapons. Gunpowder was dirty and loud; it was the weapon of craftsmen. By the middle of the 15th century, knights were unimportant to the outcome of a battle. By the close of the century, knighthood was an expensive aristocratic hobby.

Becoming a Knight

Knighthood training could only be given to boys from noble families. They had to own land (or hold it in fief from the king), and they must have the right to a coat of arms. Only the king could grant the right to a heraldic coat of arms. The coat of arms indicated that the family owed feudal service to the king and must provide a certain number of knights in time of war. A landless but noble family, perhaps a family that had recently lost its land, could still train a son as a knight. He would be known as a knight errant, a knight without a manor to support him.

The training for knighthood often meant living away from home for much of a boy's childhood. The most common placements were an uncle, most likely his mother's brother, or a powerful lord who had an informal school for knights at his court. The boys trained by the count were often the sons of his knights and vassals, and their presence and good treatment ensured their fathers' unbroken loyalty.

The first task for a future knight was to learn to ride a horse very well. Boys learned to ride ponies from the youngest possible ages. They learned basic riding (mounting, dismounting, jumping, and maneuvering) until it was second nature. A squire or full knight was expected to ride effortlessly. There was also weapons training with wooden swords and lances. Boys trained several hours a day in sword use, wrestling, and boxing. On their ponies, they aimed wooden lances at targets to practice handling a lance and a horse at the same time. The practice target was called a quintain. The quintain had a central pole with an arm that had a target and, on the other side, an arm with a large hanging sandbag. The rider had to hit the target and avoid the sandbag.

In some cases, boys training to be knights learned to read and write. They learned their prayers like other schoolboys, and they were taught the Latin military classics, such as the wars of Julius Caesar. At the height of the fashion for courtly love, young men were expected to read epics and romances.

An older boy took a turn as a page, serving at table. He was being trained in matters of social hierarchy and manners. Pages also helped knights dress and carried messages. Although they were being groomed to take a leading role in society, they were trained to serve and not to consider any kind of service beneath them. An ideal page was perfectly unobtrusive and polite, even if he was violent in combat training.

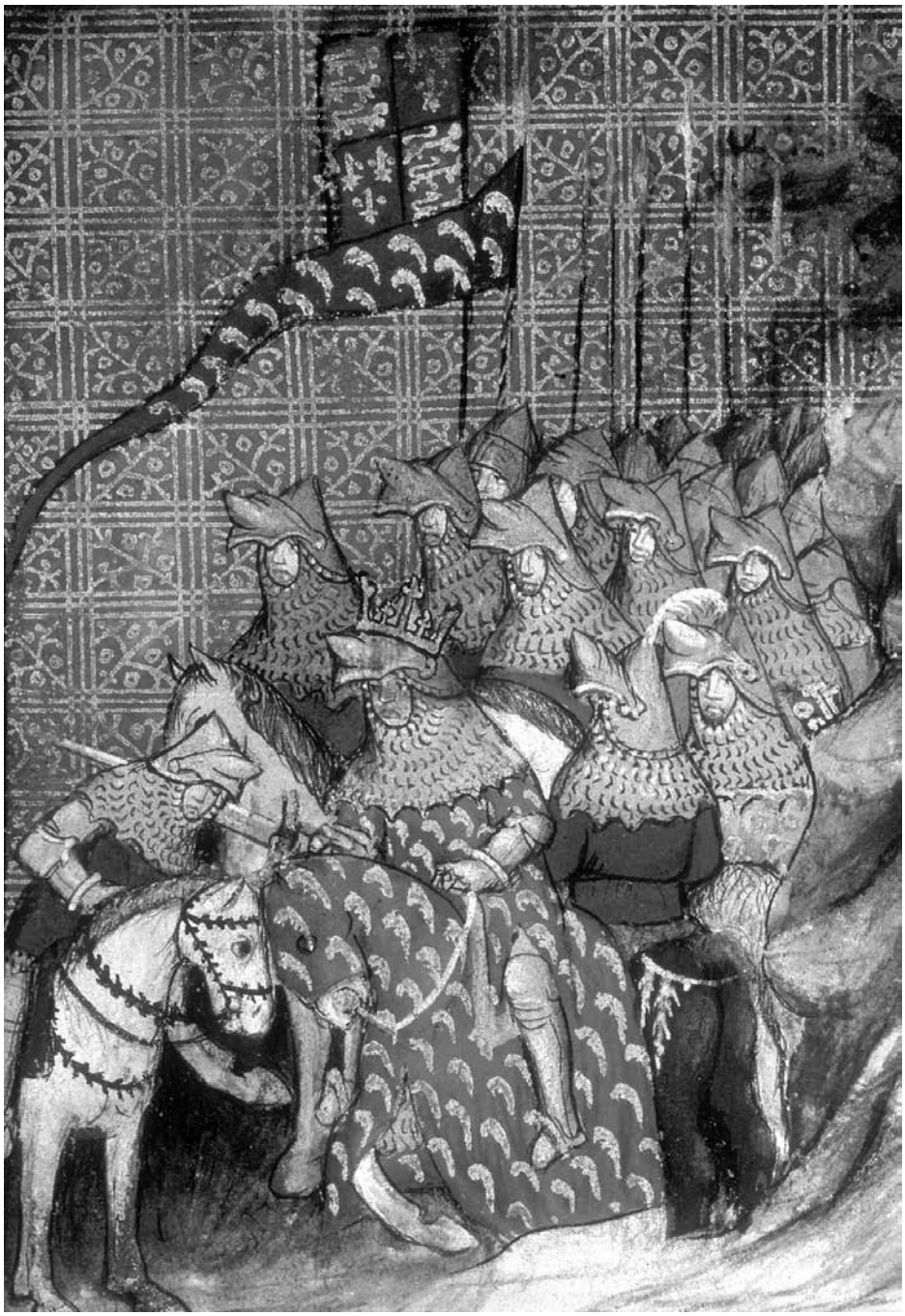
As teenagers, knights in training practiced wearing armor for many hours so the weight did not tire them. They learned to climb ropes or ladders in full armor and to jump on and off a horse easily. They continued advanced weapons practice and studied tactics through chess. They learned skills for hunting deer and boar.

In the last stage, they became squires for particular knights and began to accompany them to tournaments or war. This stage could last for an indefinite amount of time. For aristocrats, knighthood would come soon. Less wealthy young men could be squires for several years. One advantage of their service as squires was the travel; squires came to know knights from many countries, and, if they stood out as good future knights, they were themselves known by the time they became full knights.

The ceremony of creating a noble knight was called dubbing. Warriors who were merely trained soldiers could not be dubbed; they had to be from noble families. The dubbing ceremony was originally a matter of giving good weapons to a new fighter, commissioning his sword in the lord's service. In the original, simple ceremony, an established knight or lord gave a young man a sword and a pair of spurs, with a kiss and a declaration that he was now a knight. The ceremony was this simple on the battlefield if a squire had shown bravery and was made a knight on the spot.

During the 12th century, the ceremony grew more complicated. By the late 13th century, the ceremony was a complicated ritual with religious symbolism, and it remained elaborate until the end of the period. It was no longer a practical matter of being designated a fighter for the king; it was a rite of passage for the sons of noblemen. When a boy had trained with a group of young men, they were often knighted in the same ceremony, with the lord who had supervised them doing the knighting. If one young man was royal, he would be knighted first and might in turn knight his friends. There was significance in who dubbed a young man a knight, where, and when. Tournaments were common times to be knighted; the young man's father might sponsor the event in his honor. Some candidates made a pilgrimage to Jerusalem, where it was a special blessing to be dubbed a knight.

Geoffroi de Charny, one of most honored knights of 14th-century France, wrote a treatise on knighthood a few years before his death in battle. The ceremony he described was by then traditional, and each step had a rich



One of the greatest honors was to be knighted on the field of battle. A man given this honor was nearly always of noble birth and had completed basic knight training; usually, he was a squire who fought as well as the knights he served. (The British Library/StockphotoPro)

symbolic meaning. In Charny's description, the ceremony began the previous day, with confession of sin to a priest, Mass, and a long bath in which the young man pondered his sins. When he climbed out of the bath, he was to leave those sins behind. He went to rest in a bed dressed with new sheets until some knights came to dress him for the ceremony.

The knights dressed him in a symbolic set of clothing. First, they put on him a new white shirt that symbolized purity from sin and, next, a red tunic that symbolized a willingness to lose blood in defense of the weak. Black hose meant that death could come at any time but that this fear must be trampled underfoot. A white girdle symbolized purity and chastity. Finally, a red cloak symbolized humility.

The knights led the candidate to church in this dress and stayed with him all night to pray against sin. Some candidates may have held a sword hilt as a cross while praying. In the morning, they all went to Mass, and then to the dubbing ceremony. There, the presiding knight gave the candidate a pair of golden spurs to symbolize that the riches of the world must be trampled underfoot. The knights who were assisting buckled them onto his feet. The presiding knight then kissed the candidate and gave him a light tap on the shoulder with the sword. In other versions, the presiding knight sometimes slapped the candidate's cheek. He declared publicly that the young man was a knight, and the ceremony was over.

A large feast followed. In the Magna Carta, the king was restricted from collecting occasional, extra taxes except on the occasion of his first daughter's marriage or the knighting of his oldest son. A royal knighting meant an extremely sumptuous feast, but any knighting required a large feast. The feast could be costly enough that some men would remain squires most of their lives if their families could not afford the ceremony.

Courtly Manners

The code of chivalry stipulated a set of manners when the knight was not in battle. He was to make his manners pleasing to women. He had to know polite replies and comments for conversation with ladies, and often a knight was expected to know how to dance. A knight was not required to know how to read, but he should be able to speak well and give witty replies in company. He should keep himself clean and dress in fine clothing that would please ladies when he was in the hall. Young knights in the 14th and 15th centuries wore their hair long to the shoulder and may have curled it with a hot iron. They were clean shaven. Silk clothing in fine patterns and bright colors was popular even for men, and shoes had long points at the front.

By the 13th and 14th centuries, knights had to speak and act in very pious ways. They were not to fight during Lent or on Sunday, and they

had to pray and go to confession. Knights were not supposed to chase after wealth, especially at the expense of brave deeds. They were supposed to help the weak, and some knights who took the code seriously rode off to help catch thieves or outlaws who had molested women.

The knight was expected to fall in love with a lady, either married or single, and to devote himself to winning her favor by doing great deeds and behaving well. Stories and songs at court told about brave kings and knights who fell in love with ladies—often ladies who were married either to their vassals or their lords. The stories were written to amuse and please ladies, so they portrayed beauty and virtue as more important than rank at a time when rank meant everything. Many of these stories portrayed the knights of King Arthur's Round Table in contemporary France; Lancelot's love for married Queen Guinevere was a model for how knights ought to behave.

Courtly manners were not only about politeness and love. A knight had to show outstanding courage; he had to take extra risks. Sometimes, in order to demonstrate his love for a lady, he told her that he would undertake an adventure to bring her honor and win her favor. One simple adventure was the *pas d'armes* in which a knight, usually a knight errant, took up a position by a bridge and challenged all who passed to fight. Only other knights were permitted to fight with the knight; merchants and farmers passed in peace because they were not noble. If he unhorsed an opponent, tournament rules of ransom applied.

Monastic Knights

The Knights Templars and the Knights of the Hospital began a tradition of religious orders of knights. These monastic knights embodied all the ideals of the Middle Ages. The ideals of monastic spiritual peace and warrior strength came together in the notion that the monastic knights fought a spiritual war with earthly weapons. Bernard of Clairvaux, one of the most extreme voices for the monastic ideal, praised the idea of the Knights of the Temple, calling them something new, unknown to past ages.

Monastic knights had to take the vows of both monks and knights. They promised to be unmarried and chaste, to live in poverty and own nothing but what the order gave them, and to follow the rigorous hours of prayer. When they were in the chapter houses of the order, they lived in cells like monks. Theoretically, their weapons and horses were not their own, but belonged to the order. They also took the vows of knighthood with an additional twist: they vowed to uphold the war mission of the order and to obey the head of the order. They did not owe fealty to any prince, but only to the order, and the order answered to the Pope.

There were three orders of knights during the time of the Crusades: the Order of the Hospital, founded in 1113; the Order of the Temple, founded

in 1118; and the Teutonic Knights, founded in 1190. Each had a different mission and a history that played out very differently.

The Order of the Hospital began as the custodians of a hospital, a resting place, for pilgrims to Jerusalem. They were primarily monks, but their vows included a vow to take up arms to defend the hospital or the city of Jerusalem. They took in sick and wounded knights. Although the Hospitallers began in robes like monks, they began to wear chainmail. Some knights who felt themselves in need of penitence for violence joined the Hospitallers order. When Jerusalem was retaken by the Saracens, the Hospitallers moved to Acre as the Knights of Saint John, and some became the Knights of Malta and the Knights of Rhodes.

The Order of the Temple began as a group of knights who took vows as monks with a mandate to protect pilgrims and defend Jerusalem. At first, they lived in the Al-Aqsa Mosque, which was mistakenly called "Solomon's Temple," so they became known as the Knights of the Temple, or Templars. Many of those recruited to the Templars were knights who had been excommunicated by the church and wished to do penance. To take the vows of a Knight Templar was to get an automatic pardon for past sin and an automatic assurance of heaven if the vows were upheld. The knights lived by a strict monastic rule of poverty, obedience, and discipline.

The master of the Templars was not responsible to the governments of Palestine or Europe, but only to the Pope. In Europe, many wealthy people willed tracts of land to the Templars in order to obtain Papal indulgences. The order became conspicuously wealthy, managing farms all over Europe and maintaining several international headquarters. They began to develop international banking methods in order to transfer funds from one branch of the Templars to another. The Templars became one of the greatest financial powerhouses in Europe by the 14th century, in spite of the vow of poverty that individuals took.

The Templar knights were drawn into fighting in Spain against the Muslim government, helping the Christian kingdoms of the north take back territory. Templars built castles in Spain and brought back some of the Arabic culture to Europe. Gradually, many in Europe shifted from viewing the order as the pinnacle of Europe's ideal of spirituality to viewing them as unaccountable, too powerful, and possibly corrupt. The downfall of the order came when King Philip of France persuaded Pope Clement, the first Pope to live at Avignon in French territory, to convict the Templars of corruption and sorcery. The order was disbanded, the king seized their property, and the knights who headed the order were executed.

Last, the order of the Teutonic Knights was founded by a group of German knights who had come to the Holy Land with King Frederick II. Like the Hospitallers, its original purpose was the care of the sick and wounded in Palestine, but, as the order grew, it also worked to defend

against the heathen on Germany's borders. The Teutonic Knights built castles and established border states in lands formerly held by Slavs, Wends, and Letts. The order became a secular power, a guard of Christendom's eastern border.

See also: Armor, Crusades, Monasteries, Tournaments, Weapons.

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Lamps. See Lights

Latrines and Garbage

Waste disposal was a constant problem during the Middle Ages. There were three parts to the problem. The waste, whether human or **animal,** had to be removed from the immediate place where it was deposited, then it had to be transported to a place where it could be considered gone and forgotten, and then the people had to be able to live with its effect on the environment. Country **houses, castles, monasteries,** and **cities** had different ways of handling these problems.

Latrines

In less crowded places, waste disposal is a less pressing problem because there is enough space to allow the earth to process the waste. Rural peasant houses had latrine outhouses, as poor rural places all over the world still do. The platform, seat, and enclosure were called a privy. Country manor houses improved on this system only slightly. In addition to outhouses, they used chamber pots in the house and emptied them into a latrine pit.

A castle was usually placed in the country and was at first a stand-alone community until a town grew up around it. Although they had no immediate neighbors, castles were crowded places within their walls. Sanitation was a pressing issue. Castles called their latrines "garderobes," a euphemism chosen perhaps because they were designed to keep the user's robes clean. Garderobe wings or towers could be several stories high, with each layer built to have separate shafts for waste to fall into. In some castles, they took the form of lone latrine closets built into a tower or cantilevered out over a wall with a clear drop below. In larger castles, and more commonly, they were designed to use a few shafts, and each provided a few seats. They might be all in one room, placed with dividers for privacy. At least one garderobe was built near the main hall for the use of guests at a feast. In some cases, the shafts for the garderobes were situated next to chimneys, perhaps to warm the air in the shaft and make the latrine less chilly.

Castles that were sited next to a river tried to build their garderobes into the outer walls above the running water. Waste fell through long shafts directly into the water and was carried away from the castle without further annoyance. Castles that did not overlook running water had to use a latrine pit. Latrines could still be built into the walls so that waste fell out of the castle, but it fell into a pit that had to be dug out from time to time. A real drawback of this system was that, occasionally, an enemy became so determined to take a castle that they would send men to climb up the latrine

This castle garderobe has survived better than many since not only the closet and chute but also the seat were made of stone. Daylight shines up through the hole, which leads straight to the sea. (iStockphoto)

chute at night to get into the castle. Waste could also fall into the moat, adding to the moat's unattractiveness. If so, then the castle's residents periodically moved to another house while the moat was dredged.

The bigger, richer monasteries developed systems of simple plumbing. They channeled rain or spring **water** through pipes into the buildings and then used the wastewater to flush the latrines out. A typical "reredorter," the wing of a monastery devoted to latrines, was planned so many monks could use the facility within a short time, since they lived on a schedule. There was a row of wooden seats, separated by wooden walls for privacy, each with a shuttered window that could be opened for light and air. Some monasteries could have used rags from old robes as toilet tissue, while most others used hay.

Monasteries often had a source of running water, either piped in or by means of a creek or diverted river channel. Monasteries with water systems used the waste from all other washing and cooking to flush out the latrines, and a final waste ditch carried all the wastewater off the property. Sometimes, the wastewater went into the fishpond, where algae fed on the excrement; this was the first simple sewage treatment system. More commonly, the sewage flowed into the nearest river. Occasionally, it fed onto someone's property.

Town buildings with space to include a cesspit in the backyard did so. By the late Middle Ages, city ordinances usually required that cesspits be lined with **stone** to try to keep them from leaking into the surrounding soil and contaminating wells. Some cesspits used **barrels** to line the shaft. About every two years, they had to be dug out and the muck carted away. Digging out cesspits was a regular trade for some laborers. The manure from each pit was hauled out of the city in **carts.** It was a valuable resource for **agriculture** and was often sold as fertilizer after minimal processing.

A cesspit usually had a privy built over it. Frequently these were shared among several families and could have more than one seat. When a large city house had room for a cesspit, the owners sometimes placed a latrine at the back of an upper room (a solar), with a pipe carrying the waste to the pit outside. This was the closest thing to indoor plumbing. Anyone who did not want to climb down the stairs or ladder to go outside to the privy (or who did not have a privy) used a chamber pot and needed to empty it into a cesspit.

Some cities had public latrines to keep the streets from being filled with filth. London, in the 14th century, had a row of public toilets along the river where the tide in the Thames Estuary would flush the cesspits out twice a day. The privies were divided into men's and women's. River latrines gradually turned the city's streams into open sewers.

In 1357, King Edward III set out to inspect the Thames and Fleet rivers. These rivers stank badly even by medieval standards. Only 10 years earlier, the Black Death **plague** had swept through London, and nobody knew what had caused it, but "bad air" was considered a great risk factor for a repeat of the plague. He closed some latrines along the Fleet and Thames rivers and forbade the building of new ones. The rivers were dredged, and owners of the latrines that remained had to contribute to the cost.

Garbage

Cities had the most difficulty with sanitation. In cities, people, animals, and businesses were packed into a small space, with no room for each family or business to develop its own outhouse or latrine pit. Waste often went into the streets. This included not only human waste and animal waste, but also butchering waste (blood, entrails, and skin). Dogs, pigs, and rats roamed the streets eating what they could. Large city streets, especially in the 14th and 15th centuries, were sometimes paved and had gutters and drains. A wide street with two gutters could count on rain washing the streets at times. Cities like London also employed rakers to sweep the streets and carts and **boats** to carry the refuse away. Cities also tried to exterminate rats, although they were not aware of the rat's role in spreading disease.

Medieval people maintained a certain amount of recycling for pragmatic and economic reasons. Some food waste could be turned into materials for industry, like the bones and skin from butchering that went to make glue, leather, and parchment. Butchers may have dumped blood and entrails, but much of what could have been dumped was sold to pie makers or given to charity, since the poor were always happy to eat any animal products. Worn-out **clothing** could always be made into something else, and eventually it became either high-quality toilet tissue or rags sold to the **paper** industry. **Parchment** and paper were rarely thrown away; they were repurposed by having something else written on the reverse or by being scraped or erased for a second use. Broken **glass** was called cullet; it was collected to be melted again by glassmakers. Candle ends, which could be melted down, were treasured to the point that they were part of some **servants'** wages and benefits.

Still, garbage disposal, particularly of industrial waste such as the scrapings and used chemicals from tanning, was a huge problem in cities. In Paris, there were civil trials in which neighbors sued butchers, arguably the messiest of the trades, for fouling the streets and stinking up the air. Butchers were supposed to haul their waste outside the city, but many put it into the street instead. The city finally forced many butchers to move outside the walls and locate along the Bièvre River, where tanners and dyers were also locating. The river soon became nearly clogged with sewage, which then flowed into the Seine and eventually out to the sea.

Italian towns passed stringent regulations for keeping the streets clean. Dumping water from upper windows was against the law; backyard privies had to be walled up and lined with stone so as to keep from leaking. Streets had to be kept clean; even grape skins were to be swept up. Neighbors were responsible for periodically washing the streets with river water. Dead animals had to be hauled outside the city, as did all other bone waste. All violators who were caught were immediately fined.

Toward the end of the Middle Ages, some cities had built drains and sewers into their main streets. Citizens who lived along these roads sometimes piped their waste into the city's main drain system. The hygiene-conscious Italian cities encouraged and at times required this, since it kept the alleys from becoming smelly marshes.

Ultimately, the waste all emptied into the nearest running water. Cities situated on rivers were easier to flush, but the resulting river pollution could be extreme. Smaller channels could become hard to navigate due to the volumes of floating waste, and even large rivers smelled bad. The water was no longer safe to use, which was a problem since many people had traditionally used river water. The fish were polluted as well and could not safely be eaten. Improperly treated waste could also contaminate wells, es-

pecially within a city. Cities tried to keep public water supplies clean, but it was not possible to keep anything entirely clean.

See also: Cities, Monasteries, Water.

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Lead and Copper

Medieval Europe used **gold** and **silver** for coins, **iron** for weapons and some tools, and only a few other metals for all other purposes. Copper was mined on Cyprus, in Germany, and in a few other places. Trace elements of metals like arsenic and antimony were found in the impure copper ore, and, for cheaper products, they were often left in to add bulk; the best copper, used for casting fine bronze and brass, had to be refined. Tin and lead were often found with silver and had long been mined in England, France, and Germany. Metal was also recycled. The Romans had used lead for many purposes, and the pipes, gutters, and tools they left around Europe were melted and recast.

Copper alloys commonly were used to make many household objects, especially for the **kitchen.** Bronze was an alloy of copper and tin, with very little zinc. Brass, on the other hand, was made of copper and zinc, with little to no tin. Gunmetal, also called latten, used copper, tin, and zinc together. Lead could be mixed into any of these, especially latten. Since medieval craftsmen had no sense that lead was poisonous, they did not hesitate to use lead in metal alloys for pitchers and other table utensils. Latten was the cheapest metal and could be used for many small cast objects, especially candlesticks. Pewter was an alloy of tin developed in the later Middle Ages. A poorer sort of pewter, used for pots and candlesticks, was made with lead and tin. Fine pewter was made of copper and tin, and it was considered

nearly as good as silver. It had a higher proportion of tin, as compared to bronze, which was higher in copper.

Bronze items were cast using the lost-wax method. The desired shape was carved in wax, which was then packed into clay. When molten bronze was poured into the clay, the wax melted and poured out drainage holes. The bronze filled the spaces and, when cooled, took on the original shape of the wax. Bronze casters were sometimes called potters in English; casting molten metal is also called foundering, and the place that does it is a foundry.

Bronze casters made many kinds of kitchen pots, and they also made chamber pots. Households used as many bronze pots as iron ones, although later times used only iron skillets and cauldrons. Bronze casters also made church **bells,** which was an art in itself. Those who specialized in the craft were bell founders. The bronze for bells was approximately four-fifths copper and one-fifth tin.

Bronze and brass were used to make **funeral** effigies and memorials. Only royalty could afford three-dimensional cast bronze effigies. For one set of effigies of King Henry III and his daughter-in-law, Queen Eleanor of Castile, a goldsmith carved the wax originals. A bronze founder used these wax figures to mold and cast in bronze. Brass was a new material in the Middle Ages. It was cast in sheets and made into flat, etched funeral memorials.

Thousands of pilgrims came to holy places like Canterbury, the site of the martyrdom of Saint Thomas. They wanted to carry away a holy souvenir, but many of them were humble people who could not afford much. Lead badges were the cheap solution. A lead badge could be affixed to the pilgrim's hat or pack, and it would not easily break or rust. Lead pilgrim badges in many shapes were turned out by the thousands all over Europe. (Museum of London/StockphotoPro)

Lead was a very useful metal because it was soft and because its melting point was so low. It did not require specialized furnaces, but it kept its shape in air temperatures. Plumbers melted new and old lead into sheets and then cut it into roof tiles; lead roof tiles were the most popular kind. Lead was also used to hold together panes of glass, both clear and stained. Lead was easy to cast and bend, and it could be soldered in place with a mixture of tin and lead, using salt or tallow as the flux.

Lead pipes formed the **water** systems of many monasteries and cities. Rome had used lead for pipes, and no physicians had yet noticed lead poisoning, perhaps because it was widespread. First, the metal was melted and cast in sheets. Long strips of sheet lead were bent around a wooden pole, and then the pole was removed. The pipe needed a firm seam to make it watertight. Lead was easy to melt, but it always needed a mold, even for a seam. The new pipe was filled with sand and wrapped in clay, leaving only the crack where the seam needed to be. Now the craftsman could pour very hot lead into the crack, where it melted the edges of the pipe and then cooled, forming a welded seam.

Both pewter and pure lead were molded to make decorative shapes and pins, such as badges **pilgrims** pinned to their hats. Although lead was not a precious metal, lead pilgrims' badges could be mounted with small, inexpensive jewels. Lead could also form a white crusty oxide when exposed to ammonia, and this white lead was the main source of white pigment in paint. Roasted, it turned yellow and orange.

See also: Bells, Iron, Kitchen Utensils, Painting, Water.

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Libraries

In ancient times, there had been libraries of clay tablets and scrolls, and the Romans had both public and private libraries in many cities. Some public libraries in Rome were like modern reading rooms, and some were placed

in the building that held the public baths. Each book, in the form of a **parchment** roll, had a little tag on the end of it bearing the author's name. Rolls were stacked on shelves or set upright into buckets. Some of these ancient Latin scrolls were still housed in the oldest medieval libraries, such as in Rome itself. Another form of **book,** the codex, was developed in the first century A.D. A codex was a stack of thin boards that were covered with parchment; little holes were drilled in the edge so the boards could be bound together with cord.

Christian writers in the early Middle Ages preferred the codex over the scroll for their copies of the gospels. In many cities, bishops amassed private libraries, usually consisting of either books of the Bible or commentaries on the Bible and religious issues. However, some bishops also had secular works in their libraries. In the seventh century, the famous scholar Isidore, bishop of Seville, owned a notable library. He had not only religious and biblical books but also copies of books by famous Latin writers of earlier centuries, along with medical books and legal writings.

In the early 800s, Charlemagne made great efforts to broaden Frankish book production. He set monks and scholars to copying books, and he organized schools to encourage literacy; he and his sons attended, to set the example. Under Charlemagne's encouragement, **monasteries**' book holdings expanded. Libraries that contained only 30 or 40 books before Charlemagne's reign had as many as 300 books by the middle of the ninth century. The largest monastic libraries had more than 600 books, an astounding achievement in the relatively primitive Frankish kingdom.

The greatest libraries of medieval Europe were located in Cordoba, the capital of **Muslim** Spain. Arab scholars were enthusiastic translators and writers, and the city kept hundreds of copyists employed. The caliph's library was reputed to have 400,000 volumes, and it was one of perhaps as many as 70 other city libraries. Other Andalusian cities like Barcelona had great libraries and became centers of learning that drew scholars from the Christian countries. The Muslim passion for translation preserved, at least in Arabic, many Greek classics that were otherwise lost. Aristotle's reentry into the scholasticism of Christian Europe began with the Arabic translations of his works, which then were translated into Latin for use in European universities.

As the monastic movement spread across Europe, monasteries developed libraries in conjunction with their scriptoria, especially in Italy, Germany, Switzerland, and England. The scriptorium was a well-lighted room where monks worked as scribes, making new copies of books and, like the rest of the monks, working six days a week. Sunday was not a workday, and in many monasteries the monks were to get a book from the monastery library and spend the day reading the Bible or other Christian literature.

Bologna's university was the first established in medieval Europe. Its library has one of the greatest antiquarian book collections in the world. (Kelly Borsheim)

Most monastery libraries had only a few hundred books, but they were required to have at least one book per monk. Books from the library also were used in the schools that many monasteries started, where the monks taught the village boys to read.

A few monastery libraries loaned books to the public, but with a strong emphasis on making sure the books were brought back. In some cases, the borrower had to leave something of value with the librarian as a deposit to assure return of the borrowed book. Some libraries coped with the problem by chaining the most valuable books to desks. The problem of borrowers' failure to return books, whether in public, private, or monastery libraries, brought about the creation of many forms of the "book curse." These curses threatened the careless reader with dire consequences if he failed to return the book, including eternal damnation, disease, agony, and the judgment of God himself.

By the end of the 14th century, there were more than 75 **universities** in Europe. Each one had its own library, often with a "great library"—a reading room where people could study. The university's "small library" was a storeroom for books loaned to members of the university. University libraries developed specific book collections for the study of theology, both church and civil law, medicine, and sciences such as geography and

astronomy; these books were loaned to students. Residential colleges within the universities, acting as dormitories, also collected libraries for their students. Other sources of books for students were stationers' shops—the publishers of the day—where books were copied and bound and loaned to students for a fee.

See also: Books, Monasteries, Parchment and Paper, Printing, Universities.

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Lights

The primary source of light in the Middle Ages was the sun; nearly all work was done during daylight hours. Workers began with the sun and stopped work at sunset. Many **guilds** specified that craftsmen could not work at night, since the available light sources were so poor. It would be too easy to miss flaws in the work. Certain kinds of work required many windows, and workrooms had as many windows as could be managed without losing sufficient heat. Many crafts worked in the open air.

The secondary source of light, indoors, was the fire. Most houses had open fire pits or hearths in the center of the room. Since windows provided light but also allowed heat to escape, houses in the northern regions had few windows, and they were typically shuttered in the winter. **House** interiors were dark, and the fire provided the light for most inside activity. It was enough for spinning, basic sewing, animal care, and basic cooking. When fireplaces were invented for castles and began to be incorporated into some newer **city** houses, fires could be brighter without filling the room with smoke, and they probably provided more light.

Fires could be started with a spark from fire irons. The friction of the irons being rubbed together cast sparks onto kindling materials. Lightweight, dry materials like straw, tow, dried toadstools, and dried weeds caught the spark. Dry twigs and good kindling wood made the fire grow, and finally solid wood could be piled onto it. Oak, ash, and beech were the best woods for household fires. Starting a fire was such a production that most households tried to keep their fire from completely dying out.

Banking large coals of burning wood with ashes slowed the combustion and meant that in the early morning, the servant or housewife who raked through the ashes could find coals that soon glowed red again. If the coals did not light, neighbors were often willing to send a few good coals over in a fire pan. Another simple tool, the pottery *couvre-feu,* or curfew, was a ventilated lid that could help bank the fire for the night. With good kindling, the fire was soon hot again. Fires could be made hotter with a bellows. Men also blew on fires to make them hotter.

Fire could be a portable light when carried in an **iron** or **pottery** basket called a cresset. Lighthouse beacons were controlled fires in cressets. Watchmen in cities kept cressets with burning wood all night; they could carry them to the scene of a disturbance.

The liturgical year included several festivals when candles and other lights were featured. A medieval Latin hymn for Easter describes the lighting of a new fire with fire irons and the variety of lights brought from home to be kindled at the new fire. Pottery oil lamps with wicks flickering into light, pine torches spitting sparks into the air, and beeswax candles, still smelling of honey and dripping wax onto the floor, are described vividly.

Torches were the most ancient kind of light and were used less as the Middle Ages passed. Their natural pitch content made the wood burn well for a long time. They were used in outdoor processions at night and in

Cressets were small baskets to carry coals and fire. The cressets pictured here could be carried like torches. They were the only kind of light that could be picked up easily and carried outdoors to the scene of an emergency, so night watchmen always had cressets and a central fire source. (Francis Douce, *Illustrations of Shakespeare, and of Ancient Manners*, 1807)

public meetings at night where steady light was needed. Some **castle** halls had wall brackets for pitch torches; pine torches could burn at an upright angle and sometimes burned fully upright.

A small, personal type of torch was the splint. Some kinds of wood burn very well, such as birch and the heartwood of a pine. Thin sticks were dried well and then used as wooden candles. They could be put into brackets or carried between someone's teeth while doing farm chores or housework after dusk. Some had to be carried pointing downward in order for them to burn.

Rushlights were another very ancient form of indoor lighting. The rushlight is like a very thin, primitive candle. A rush is a marsh grass that was cut in the fall at about 18 inches long. Dried, it was dipped once or twice into melted fat so that the hollow tube would fill with the fat, and then it was dried again. To burn it, the peasant rested it against an **iron** bracket that held it at an angle. It burned quickly; a full-length rushlight lasted no more than 20 minutes.

When beeswax came into use for making candles, rushes were the obvious choice for a wick. The earliest wax candles were probably made by pouring wax onto the rush with a ladle and then rolling the candle on a table as the wax cooled. By the 14th century, candle makers were using pewter molds and were also dipping candles by tying the wick material to a rod and dipping it repeatedly into liquid wax. Wax candles came in all sizes during the Middle Ages. Some thick candles were called torches; they may have had more than one wick. Candles for lighting a home, and candles for dripping wax onto envelopes, were proportionately smaller.

Beeswax candles were a luxury, and most people saw them only at church. Candles were part of the worship service, and many **monasteries** and churches kept bees to supply their candle needs. **Funerals** required candles, as did some baptism rituals; candles burned before **saints'** shrines. Gifts to churches were often made in the form of beeswax. Manor houses and castles could also obtain wax candles, but they were too expensive for common people. In wealthy houses, though, candles could even be grouped together in a chandelier, a holder with room for more than one candle. The word *chandelier* now refers to a hanging light, but a medieval chandelier could be moved from room to room. The evening meal was generally eaten in the dark during the winter, and aristocratic households used candles on the dining tables so the food could be seen.

Tallow candles were cheaper and could be used in practical situations. In great houses, the cooks began to work before it was light and needed to use candles in the kitchen. Some of these candles had lanterns to hold them. Candles were always a fire hazard; many inquest records mention that a

Medieval lanterns sheltered a candle from the wind. (Museum of London/The Bridgeman Art Library)

candle had been left burning in a room and had fallen and caught the room on fire. It was not normal practice to leave a light burning at night. Candles were not allowed in some stables, where they were a fire risk. Hospitals and monastic infirmaries kept a candle burning at night.

Candles were held by candlesticks when they were not held simply in the hand. Some candlesticks had a spike to set the candle on, which may be the oldest kind. They could be used with any size candle. Newer candlesticks had a socket that had to fit the candle, so they may have been in use only after candle makers began using molds. There were also candle lanterns, made of tin or **copper,** with large holes punched to allow the light to shine out. They had hinged or sliding doors to place or remove the candle and a pierced top to allow heat and smoke to escape.

One of the documented uses of candles was the candle **clock** invented by King Alfred to time his hours of work and study. He ordered his craftsmen to make six candles that would each burn for four hours and had them marked off at regular intervals. He burned the candles before saints' **relics** in his possession, so they did double duty of timekeeping and devotion. To keep the candles from burning at different rates due to drafts, he ordered a lantern made with panes of thin, translucent horn. A clock lantern like this was too expensive for any but the wealthiest to use.

Oil lamps gave a steady light and were used in many places, especially in regions with access to good oil, such as olive oil. These lamps, like oil lamps from antiquity, had a bowl to hold the oil and a spout to hold the wick. The wick soaked up oil and allowed it to burn off at the spout. Lamp design did not change for many centuries, so it is difficult to date the few lamps that have been recovered. In Northern Europe, some were made of cast iron and had an arm standing up as a bracket to hang on a wall peg. There were also simple carved **stone** and **pottery** lamps. In the Mediterranean countries, they were usually ceramic, shaped as a bowl with a spout, and were often decorated beautifully. The wick usually floated in the oil, held by a piece of cork. By the late Middle Ages, some oil lamps with floating wicks were made of clear glass. Ceramic and glass lamps were often hung from the ceiling by chains or held on the wall by a bracket. Another late medieval improvement was a bracket that held the wick in place, neither floating nor leaning out a spout.

See also: Beekeeping, Houses.

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Linen. *See* Cloth

Locks and Keys

The technology for locks and keys had existed since ancient times. The Romans took Egyptian and Greek lock traditions and developed them into primitive forms of the tumbler-locks we use today. Roman locks were installed in doors and caskets, and they also came in the form of padlocks—stand-alone locks with a locking loop of metal. They also developed the use of wards, obstacles that block the entrance of a wrong key. Most Roman locks were made of **iron** and have corroded over time, but their keys were usually bronze, and many have been found.

Medieval European lock and key technology followed the same principles. There were built-in locks in doors and in the lids of caskets, as well as padlocks. Late medieval caskets that were intended as strongboxes for valuables had hollow lids that held many locking mechanisms to make the strongbox as difficult as possible to open. Several keys were needed to open the box if it resisted brute force such as an ax. The most skilled blacksmiths made locks, and the profession grew into its own locksmiths' guild. Locks and keys were made of both iron and **copper** alloys such as brass and bronze.

A generic lock has a barrel that encloses a mechanism and a plate that is riveted or welded to the door, chest, or casket that holds the lock. Inside, there is a mechanism to hold the clasp fast unless an object of the correct size and shape is slid in to release it. The key is a shank with a ring to hold it (called the bow) and a bit on the end. The bit has to be made with precision to fit into the mechanism. The end of the shank, where the bit is attached, is part of the precision shape and is often thinner; it is called the pin. Wards are placed in the lock mechanism to stop most keys from entering, but the proper key has grooves or clefts to evade the wards.

Many medieval locks were slide locks. A slide lock's key does not turn as a modern rotary key does; it fits into a hole to release flat metal strip springs. These metal pieces are shaped like the point of an arrow and are somewhat flexible. The lock is snapped closed by pushing them into a tight-fitting hole; they spring open so the hole cannot fit them out again. The key is a lever (the shank) with a turned-up bit at the end, fitted and shaped to slide into a hole in the spring strips. It can pull them tight again so they will fit back out the same hole. This was a common type of lock and key all over medieval Europe and has continued to be used in less developed places into modern times. The bits of slide lock keys could be turned at an angle to the shank. They were shaped differently, with a variety of holes, lines, and wedges cut out of the bit.

Medieval locks also included rotary mechanisms. In this mechanism, a spring holds a bolt in place, hidden inside a metal casing (the barrel). The key needs to fit into a precision space so that it acts as a lever to move the bolt back. A rotary key had a pin that extended beyond the bit; it fitted into a hole that allowed the key to turn on an axle if its bit fit the mechanism. It could also be hollow (a pipe key), so that it fit onto a pin inside the mechanism, for the same reason. Rotary keys were shorter than slide lock keys.

In some mechanisms, the key had to turn a full circle; this is called a dead bolt, and the key is actually sliding the bolt. In other locks, the key presses against a spring as it turns only a quarter turn, and this releases the bolt. Dead bolt locks were widely used in the 11th and 12th centuries. In England, Norman-era keys have been found with very elaborate, precision-crafted bits.

Pipe keys were most often used for casket locks. Solid keys with an extended pin could be used to open a door from inside or outside, but a pipe key only worked in one direction. Extra security was possible by making the pipe key's hollow not quite round and precisely fitting the mechanism inside to this shape.

After the 13th century, locksmiths made more complicated locks with better wards. Keys were more decorative. The bow, instead of a simple

The face plate of a door lock protected and hid the mechanism behind. It was easier to make an elaborate plate than to design a lock that could not be picked. By the late Middle Ages, locks had become reasonably sophisticated. (Dreamstime.com)

loop, was often a lozenge, trefoil, or kidney shape. Doors and caskets could still be unlocked by a thief with patience and skill with a bent wire, so some high-security doors and lids had more than one lock. Some complex locks required more than one key, but it was easier to place multiple locks on something. Sometimes there was a skeleton key that could open all the locks, so the owner did not need to fiddle with so many keys. Of course, this meant that a clever thief could imitate the skeleton key.

The final achievement of locksmiths in the 15th century was a very expensive lock, usually custom-made for royalty, in which there was no visible keyhole. The owner knew of a place to press that made a spring pop open a slide to reveal the hole, and sometimes there were more layers of similar security. By the close of the Middle Ages, locks and keys at their best were stronger than the wooden chests they guarded. Brute force, such as splitting the wood and smashing the lock with an ax, could still open strongboxes.

See also: Furniture, Iron, Lead and Copper.

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M

Machines

The people of medieval Europe were fascinated with machinery. The technology of the time seems basic to us: the lever, the gear, the crank, and the wheel. But the concept of making machines at all was new and exciting. Machines could make a man's work ability faster, stronger, and taller. Machines did not grow tired, and a man could tend or guide a machine instead of proving the force himself.

The two great users of machine technology were war and industry. War machines of the time included crossbows, catapults, and drills. Industrial machinery, however, was the greatest source of innovation. Using water, wind, gravity, and human muscle, machines were applied to lifting, grinding, smelting, cutting, and pounding. Roman treatises on engineering and military machinery were available to medieval students of engineering. After about the 10th century, the most inventive minds rapidly built on this foundation.

The first mechanical principle harnessed was the use of gears, which could turn vertical motion into horizontal motion and transfer power from the source to machines. The earliest gears were entirely wooden, with wooden pegs as teeth. **Mills** continued to use wooden gears all through the Middle Ages. As the iron-making skills of the time developed, later machines incorporated metal gears that had less friction and did not wear out as quickly. In **clocks** and other small precision instruments, **iron** and brass gears were a necessity.

In the 11th and 12th centuries, the gear systems of mills became more and more complex as more industrial functions were mechanized. Belts worked with gears to transfer power from the source to a machine in a mill. Medieval engineers learned to use different sizes of wheels and belts to create more speed. When spinning wheels were invented in the 13th century, they used a large wheel with a belt to create a much faster spin on a smaller wheel. Many other machines and mills used this principle. By the end of the Middle Ages, proficiency with belts had progressed to where spinning wheels used two belts to drive both the spindle and a thread winder at different speeds.

By the 11th century, mills were using flywheels to keep the spinning motion smooth. A flywheel uses inertia by concentrating weight at the circumference of a circle so that it tends to keep spinning once started. Flywheels added speed to any spinning engine or axle.

The foot treadle was another important discovery of the 13th century. Instead of changing power from vertical to horizontal, it began the even more important transition from reciprocating motion to circular. A foot can move up and down, and a treadle can turn this into spinning motion to power a lathe. Foot treadles also operated large horizontal looms.

Another advance was the bowspring, which was first used in its simplest form—an overhead branch that wanted to spring back up when pulled down. If a saw was attached to this simple spring, the job of lifting the saw back up was much easier for the human operating it. Combined with a foot treadle, the spring made sawing go much faster. A lathe operated at high speeds if its spindle had a cord wrapped around it, attached to a foot treadle below and a branch overhead. The operator had his hands free to cut and shape and needed only his foot for power.

The last simple machine to be developed was the crank, which evolved from the windlass. It seems simple and obvious in modern times, but the crank was not invented until the 14th century, when it begins to show up in pictures as part of a grindstone. The first cranked grindstones had a crank on both ends of their axles so that two people could make them spin as fast as possible. A crank also helped wind a crossbow's bolt back; turning the crank many times required less strength than pulling the bolt back by main force. The crank went on to become the simple machine for cranes and wells.

In the 15th century, inventions began to use complicated cranks and started to integrate them with other machine principles. The carpenter's brace, which uses a compound crank to power a hand drill, first shows up in records in Flanders around 1420. An Italian drawing of the 1450s shows a waterwheel with two cranks and connecting rods operating a pump, and we have the first records of a paddle-wheel **boat** in the same period in Italy. Connecting rods permitted one power source to turn five paddle wheels or three separate mechanisms. With this invention, machinery was poised to move into the modern age.

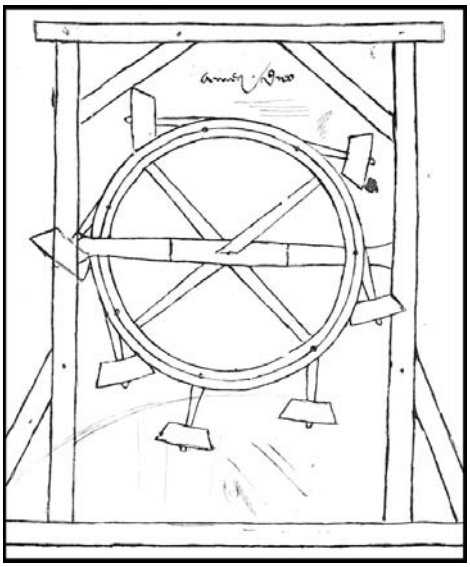
When a flywheel was added to a crank, it smoothed and multiplied the crank's motion. Any dead spots in the process of turning the crank were smoothed out by the inertia of the wheel. A grindstone with a flywheel kept spinning if the operator's arm got tired. During the 15th century, mills began using a flyball governor to regulate the speed of their waterwheels. The governor was a small device with a ball on a chain; once put in motion, it used inertia to keep spinning. The faster it spun, the higher the ball rose in its orbit. A mechanism connected to the governor raised and lowered a gate on the mill as the flyball rose or lowered; when the millrace became too strong and the milling equipment could be driven too fast, the flyball governor whirled its ball higher and triggered the mechanism to lower the gate and cut the amount of water.

Theorists and inventors explored the means of powering movement. They were fascinated with the idea of creating a machine that would power its own perpetual motion. Villard de Honnecourt, an outstanding engineer of the 13th century, left behind notebooks that included his concept for perpetual motion: a wheel with an odd number of free-swinging mallets,

each filled with mercury, fastened to its outer rim. As the mercury moved inside the hollow mallet heads and the wheel turned, there would always be enough force at the top of the wheel to make it turn and raise the mallets at the bottom. The mercury-filled mallets would become their own waterfall, powering the wheel. Other inventors suggested using magnets. The modern generator that creates an electrical flow by spinning magnets around a coil of wire seems a direct descendant of these medieval brainstorms.

Another popular and fanciful use for machines came with the invention of clockworks. Not content to ring a chime on the hour, a medieval clock maker created a mechanical show of crowing roosters, spinning dancers, or hammering workmen that came out and performed. Even before **clocks** were invented, the gears and weights that drove them were being used in other gadgets. There were "automata," toys for the rich, such as a bird that appeared to drink from a cup. Villard de Honnecourt explained how to use a gyroscope to suspend coals inside a ball, thus keeping one's hands warm without allowing the coals to touch the sides of the ball and burn the holder.

One toy was an early experiment with the power of steam. The experimenter had a **pottery** jar with only a small hole near the top, corked. Heating water to boiling, he allowed pressure to build up until the cork popped out and steam came out in a stream. The jug could be made in an amusing shape—such as a man appearing to spit the steam—to entertain guests. Another more useful gadget experimented with the power of rising hot air by operating a fan inside a chimney, powering a meat-roasting spit or vents to regulate the fire's heat. This rare gadget appeared only at the close of the



Villard de Honnecourt hoped that moving mercury inside each hammer's hollow head would provide enough force to keep the wheel turning indefinitely. As far as we know, he never built a model to try the idea. (Jean-Antoine-Baptiste Lassus, *Album de Villard de Honnecourt*, 1858)

period, and only in **cities,** but it was a step forward that was utilized by the next industrial revolution.

See also: Clocks, Mills, Tools, Weapons.

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Magic

The word *magic* means "of the Magi." The Magi were the wise men of Persia, the Zoroastrians. In the Bible story of Jesus's birth, some Magi came to see the baby, having read in the stars that a great birth had just taken place. In medieval times, this ability to read the stars and know charms and spells was originally associated with the Zoroastrians and wise men of the East, so it was called magic.

Although the popular idea of the Middle Ages is that witches and witch hunts were common, the heyday of interest in witches came in the 16th and 17th centuries, not during the medieval period. The **church** and the civil authorities outlawed and prosecuted the practice of magic, but there were few trials, and they were confined mostly to the period of the Cathar Inquisition. Most common superstition and magic went on as part of daily life.

Sleight of hand, the form of magic the modern world enjoys as entertainment, also was practiced as entertainment in the 14th and 15th centuries. Some were so simple that a modern watcher would quickly suspect the trick, such as using a very fine hair to pull on an object to make it move or suspend it in midair. Some entertainers played shell games—making a ball vanish under a set of cups—or could get free from a rope with a concealed knife. Entertainment magic at royal courts could also involve mechanical toys. If the creator would not explain or show the mechanism, then the court could be astonished at the action of the automaton. Any self-propelled vehicle was a cause for wonder. One engineering trick made a toy bird appear to drink wine.

Real magic in the Middle Ages came in two forms, although it was not always easy to tell them apart. Natural magic was just a part of nature; most natural magic has been defined by modern science as natural processes, while other beliefs were harmless superstitions. The other kind of magic

was occult, demonic magic that called on spirits. It was not accepted by most of society, and certainly not by the church.

Natural Magic

Natural magic was difficult to understand and define. Since all healing was miraculous in some sense, then all **medicines** had magical properties. The antibacterial properties of garlic have now been verified and measured, but to a medieval healer, garlic simply had a natural power of magic over some hurts and illnesses. The lodestone (**compass**) had a magical property of always pointing north, and magnetized stones magically drew together. Some natural magic was imaginary but was considered real at the time. For example, astrology explained that the stars gave certain plants or minerals powers to cure or protect. No less an authority than Thomas Aquinas believed that the stars worked influences on things on earth, causing magnetism, the medicinal properties of herbs, and the growth and death of all life forms. When so many things were unexplored and unknown, the world was full of magic. The real and the imaginary were not well distinguished.

Normal medical practice involved natural magic: a medicinal herb could have more strength if it was picked at dawn or at midnight. Its magic was increased by using it in combination with other herbs or substances or by preparing it with certain rituals. If a plant looked like a snake, its sap would help with snakebite—that was natural magic. The principles of natural magic were sympathy and antipathy. Sympathy meant that things worked on or cured what they resembled or had some affinity for. Antipathy was the opposite; if two animals were antagonists in the natural world, then a remedy from one could help cure wounds caused by the other.

Similar to natural magic was the magic of faith. It was ordinary medical practice to appeal to the proper **saints** to help with a problem. Saying certain prayers a number of times could also help the sick, since Jesus had promised to answer prayers requested in his name. If a saint or God himself accomplished a miraculous healing, rescue, or divine punishment, it was not considered magic.

Traditional medicine, as reflected in the Anglo-Saxon works "Lacnunga" and the "Leechbook of Bald," combined the natural magic of herbal lore with more explicit magic. The use of a salve based on goosefat and herbs accompanied other rituals. The user might have to act out a ritual at dawn or at midnight, at a crossroads or under a full moon. The magic ritual usually included an incantation in which the disease was commanded to leave. Bible terms were invoked, but not as ordinary prayers: for example, a medicine was to be stirred with a stick on which "Matthew, Mark, Luke, and John" had been carved.

Natural magic blurred quickly into a more explicit magic that was in a gray area between what the church encouraged and what it condemned. Some felt that superstitious rituals and taboos merely drew on the principles of the stars and the world, while others felt that they amounted to calling on spirits and invoking supernatural power in unorthodox ways.

There are four basic principles of magic in these traditional medical rituals. While any doctor of the time could prepare an herbal medicine or salve, the magical method would require him or her to observe certain taboos in the preparation: speak these words, remain silent, go barefoot, don't use **iron,** or don't have sex for a day in advance. To a nonmagical mind, these taboos and rituals have no connection to the effectiveness of the ingredients. Another principle was to select ingredients not on the basis of their components, but on the basis of some physical trait, such as resemblance to the disease. Jaundice, which made the skin yellow, was treated with something yellow. Male **animals** were considered stronger, so the hair, bone, or flesh of a male animal was supposed to make a stronger medicine.

Astrology and incantations were the two other markers of magic. A remedy's strength was thought to depend on qualities the stars projected into it; certain remedies needed to be tried under certain astrological signs. The rays of the sun would add or subtract power from the herbs or other ingredients of a medicine.

In the old Germanic tribes, written letters were considered magical; cutting runes into a rock or a piece of wood not only conveyed information, but it also worked magic. Runes could cure or kill, depending on the skill of the one using them. Medieval occult magic continued to put emphasis on the written word. Incantations had to be spoken over the preparation or use of medicine; they could also be the medicine: for example, write the names of the saints on a paper, and tie it to the sick person, or speak a word like *abracadabra* over the remedy while preparing it. There were many variants on Latin and other languages that created magical phrases to add power to a medicine or salve.

Charms were special incantations to speak over ailments, usually phrases with reference to the Christian religion. They were often very short stories about angels or Christ healing a person of a particular problem, such as toothache or headache. Repeating the story in its exact words was supposed to cure the problem. While most charms called on the powers of Jesus and the saints, some charms called on spirits to control the weather or give supernatural power in some other way.

Amulets were objects carried to give magical protection against certain problems. A hare's foot was a common amulet that protected its wearer from danger. Rosemary could keep away venomous snakes and evil spirits. Mistletoe could ward away conviction in a court of law. Some amulets had

to be created with charms and other magical powers, such as herbs collected under a certain astrological sign while reciting a prayer.

In aristocratic circles, some believed gems had magical powers of protection. A sapphire could cure eye disease; Saint Edward the Confessor's ring could cure epilepsy. Gem dealers encouraged these legends as a way to sell gems. **Books** called lapidaries explained the magical power of gemstones. The bishop of Rennes' popular lapidary claimed that the magic of gemstones was merely the natural magic God had created in gems. Sapphires could dispel envy, and magnets could detect marital unfaithfulness.

Relics could operate as amulets; dust from a saint's tomb, or the host itself (surreptitiously taken home from Mass), could be carried as a protector. Relics differed from true amulets in that the owner believed the power was not in the relic, but in the prayers of the saint in heaven, but the dividing line between a relic and a hare's foot was not always clear to the common people. The church viewed the misuse of relics as superstition, not as true magic, and tried to teach the people not to use them this way.

Talismans were similar to amulets, but they had written words. A talisman's words might be a prayer or the names of a saint, but often it was a set of nonsense words or a pattern. One common pattern was to form the opening words of the Lord's Prayer, *Paternoster,* into vertical and horizontal lines that crossed at the central *N*. Another was to form a magic square

This amulet from pre-Christian Iceland is in the shape of Thor's hammer. At the top, a dragon's head provides extra magic for the amulet's owner. Amulets like this one were used well into Christian times, but Christians also made their own charms based on the saints. (Werner Forman Archive/ StockphotoPro)

in which the same words read at the top and bottom and vertically: *sator, arepo, tenet, opera,* and *rotas* formed a square like this. *Tenet* is a Latin word, as is *opera,* but they had no meaning in the square. The power of the letters was not in their meaning or in invoking any saint.

Exorcisms were rituals to drive out demons that were causing illness. They could be carried out by priests under rituals prescribed by the church, but they were done more often as folk remedies. The ritual typically consisted of a text for the exorcist to read while making the sign of the cross at many points and "abjuring" demons and elves to leave the person alone. Names of saints were invoked, but mysterious foreign names were also invoked, with incantations of Latin and other foreign words.

Astrology and Alchemy

Astrology and alchemy were magical sciences. They were connected to astronomy and chemistry, but they sought to use the power of the stars and minerals to gain power. They were not illegal, and some monarchs made use of both magical sciences.

Astrology, the magical science of the stars, came to Europe through Arabic books of lore. It appeared to be very scientific, and medical schools began to incorporate its teachings. Astrology was a part of natural magic, rather than occult magic; the stars had certain powers, and these powers were morally neutral. It was a matter of scientific study to learn what the stars were influencing or predicting. Many European kings, including the scientific emperor Frederick II, had astrologers to tell them when they should do various things.

Arabic texts on astrology also suggested ways to incorporate the stars into magic rituals. These rituals incorporated many of the common traditions (written names, herbs, and charms) but included references to the constellations and used astrology to recommend when to use the rituals. Some charms went farther and instructed the user how to pray to the stars or planets.

Alchemy was a form of natural magic that evolved into the true science of chemistry. In early forms, alchemy invoked stars and spirits or used charms and amulets. While the goal of the alchemist was to produce **gold,** the actual practice of alchemy involved many practical techniques still used in chemistry. Alchemists distilled, melted, classified, and observed. Their laboratory equipment began as the apparatus of natural magic but became the tools of science.

The magical side of alchemy often depended on the supposed secret writings of the ancients. Aristotle had written a secret treatise and had taken it into the grave; the priests of Egypt had preserved ancient knowledge. One book, supposedly by Aristotle, was widely read, but the text frequently

Medieval alchemists were unscientific scientists, but some of their discoveries led to the development of chemistry. They combined elements and other minerals, but with only magical theories of why materials reacted with each other. The alchemist's tools resembled those of a modern laboratory. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

mentioned how it must be kept secret. Legends grew up around other figures, such as Pope Sylvester, who had begun life as a humble scholar in **Muslim** Spain, the scientist-cleric Roger Bacon, and the monastic author Albertus Magnus. The stories told about how they had obtained secret knowledge with magic. In some stories, they discovered hidden treasure, and in others, they made heads that could talk. There were stories that these men had written secret books about their lore—the original wizards' books.

Occult Magic

Occult magic was an appeal to the spirits to achieve what Christians considered it was only proper for God's power to do. It often had its roots in pre-Christian pagan religion. Just as Christians had prayer rituals to invoke the help of the saints, pagans had used rituals to invoke the help of their gods and spirits. However, some medieval occult magical practices are not directly connected to pagan religion as we know it.

The chief aims of occult magical practices were usually love charms, charms to become pregnant, or charms to inflict death on an adult or unborn baby. While there are records of both men and women using charms

and potions, women had a greater reputation for this knowledge. Younger women tended to go to old midwives to ask for a love potion or a charm for or against becoming pregnant. Many midwives were practical physicians who delivered babies and did not dabble in charms, but some did.

Since the early Middle Ages, European rulers had tried to outlaw occult magic. Since they themselves believed in natural magic, they did not try to outlaw the simple use of folk remedies and charms. They did try to regulate charlatans who traveled about performing exorcisms or curses. Charlemagne decreed that those found guilty of sorcery should become **slaves** on church estates and that those who sacrificed to the devil should be executed. Other kings extended these prohibitions to charms and potions, probably because they believed in their power and considered them to be no different from hurting someone with a weapon.

The church listed sins of magic in its manuals for penance, and both theologians and preachers spoke strongly against magic. Franciscan and Dominican friars, who preached to the common people in the 13th century, spoke against magic frequently. Bernardino of Siena, in the early 15th century, collected objects from magical rites and burned them publicly. Theologians tried to define the line between natural magic and occult magic. A magnet was considered natural magic, so the church acknowledged some forms of magic; Thomas Aquinas attributed the magnet's powers to the stars. But other forms of magic could not be natural and must be occult, and therefore illegal. The church also condemned magical use of herbs or even holy relics in ways that seemed superstitious rather than properly faithful.

During the Inquisition in Toulouse, which sought to end the Cathar religion, the inquisitors also asked about magic. Some people accused others of witchcraft. The accused confessed, often under torture, that they had used wax images to inflict pain and death, had carried out rituals to dedicate themselves to the devil, and had made charms and potions to harm others. The inquisitors recorded their testimony and permitted them to repent of these things as sins, but the civil authorities tried them as witches, and most were executed.

Most other trials of witches during the Middle Ages involved high-profile cases. When the Frankish emperor Arnulf died suddenly in 899, probably of a stroke, some people were accused of bewitching him. King Lothar II claimed that his lack of children was caused by witchcraft and sought to divorce and remarry on those grounds. The Knights Templars were accused of practicing magic against the king of France and the Pope, and Joan of Arc was convicted of witchcraft by the English. When people were officially condemned for witchcraft, they were burned alive.

However, for much of the period, there was a legal deterrent against bringing accusations of sorcery and witchcraft. The accuser was expected to prove his allegations, and if he could not, he could suffer the penalty

the defendant would have faced. This made trials for sorcery rare, but in towns and villages, when someone was suspected of casting hostile spells and charms on others, the people often took informal action and killed the witch by drowning, burning, or other means.

True occult magic took the principles of common magic and went further. Magicians used rituals and taboos, resemblances, and incantations but with more elaborate, secret, and usually violent alterations. Spirits other than saints and angels were invoked, and the purpose was often to do harm: to kill, to curse, or to make someone do something against their will. Charms were curses when they were intended to bring trouble on someone. The natural magic of similarity, or sympathy, was often invoked. An object that resembled someone, either naturally or perhaps by being shaped to resemble him, could be used to gain power over him. A knife stuck in a dairy barn wall resembled a cow's teat and could be used to steal milk or curse the cow. A wax figure of a person could serve as a proxy for inflicting pain on the person.

Divination was the practice of telling the future, usually from signs in nature but sometimes from man-made objects like dice. Diviners claimed to interpret thunder or bird calls. Thunder had different meanings in each month, particularly in months when thunder was rare, and it could prophesy anything from good harvest and peace to death for certain people and war. Diviners could look for portents in a reflecting basin or even in holy oil put onto a fingernail. There were also many superstitions about lucky and unlucky days or events. "Egyptian days" were always unlucky, and nobody should get married or undertake anything important on them. Divination could uncover unknown information, such as the identity of a thief or the location of lost property.

The darkest side of medieval magic was the necromancy that took place among some priests, monks, and others who were ordained for a church role, including many **university** students. They could read, and they had access to many books others did not know. They knew the rituals, and they were able to concoct corrupt versions. Most priests and monks remained wholly orthodox, but a small minority began to dabble in black magic. Necromancy was different from superstitious common magic in that it intentionally called on the devil and demons.

The most common kind of necromancy was a perversion of the rites of exorcism so that instead of chasing away demons, the ritual invoked their power. Much of what we know of these unusual medieval rites comes from inquisitors of the 14th and 15th centuries. The inquisitors burned the books they found, but they wrote an account of the contents, and they also heard confessions of repentant necromancers. While some of the rites they wrote about invoked demons' names or used magical actions similar to medical magic, other rites explicitly worshiped demons by making images

and praying to them. Some magic rites used circles or triangles, and some sacrificed animals or other substances.

The goals of necromancy were similar to the goals of simpler kinds of magic. The magician wanted to know secret information about the present or the future or wanted to have skills and powers without study or practice. The magician wanted powers beyond those of other human beings. Some wanted to conjure illusions to fool other people.

See also: Jewelry, Medicine, Relics.

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Maps

Medieval maps began without a tradition of geographical mapping. The first maps portrayed a theological idea and leaned on Roman knowledge. Pushed by the pragmatic necessities of sea voyages, Mediterranean sailors in Genoa and Venice developed more accurate maps for finding ports. The two types of maps did not influence each other at first. By the late 14th century, new geographical information coming from travelers like Marco Polo forced mapmakers to revise their methods. By the middle of the 15th century, world maps were influenced by sea charts and began to show more accurate shapes and sizes for land and water. **Road** maps developed even more slowly, since only a few people traveled and generally depended on local guides. Regional maps did not appear until late in the Middle Ages, and most people did not use maps in their daily lives.

The Classical Tradition

The Greek tradition began with an earth that was round, rather than flat. Pythagoras, a sixth-century B.C. mathematician, taught that spheres

were perfect shapes and that since the moon was clearly a sphere, the earth must be also. Aristotle observed that travelers and astronomers experience the earth as a sphere. **Ships** going out to sea disappear, hull first, at the horizon, and a southbound traveler sees new stars appear over the horizon in front of him while familiar stars disappear behind him. During a lunar eclipse, the shadow of the earth falls across the moon's surface, and the shadow is curved. For these reasons, the ancients taught that the earth was a sphere.

Eratosthenes, the third-century B.C. librarian at Alexandria, estimated the size of the earth with relative accuracy. He also devised a system of latitude and longitude and made a map of the known world. Ptolemy, in the second century, devised maps using projections of a round world onto a flat surface. His book on geography included a world map and 26 regional maps. Some astronomers in the last years of the Roman Empire believed that the earth revolved around the sun, although Ptolemy rejected this idea.

Medieval Europe inherited little of the classical knowledge of the globe and its size. Their access to Aristotle was limited to translations into Arabic, and then into Latin, in the late Middle Ages. They were avid students of astronomy, but the possibility that the solar system was organized around the sun, not the earth, did not come to their attention; they had only Ptolemy's astronomy, and his insistence on a geocentric universe persisted in all medieval calculations and models. Ptolemy's geography book was not in circulation in Europe until the 15th century.

However, through Roman writers like Pliny the Elder, medieval scholars had ample descriptions of the world the Romans knew. Far-off places had traditional names, like "Taprobana" for Sri Lanka or "Sithia" for Russia. Travelers all reported that there were places where dog-headed people and other **monsters** lived, and they were placed in traditional mythical places, duly marked on maps. Everything around the Mediterranean had supreme importance, most especially the Holy Land. Africa and Asia were less important because less was known about them. Ptolemy's geography was always considered the height of correct science.

Medieval Mappae Mundi

The medieval world map was based more on theology than on geography. The language of the Old and New Testaments of the Bible was taken quite literally, including such expressions as the "four corners of the earth." Jerusalem was considered to be the center of the world, and a true medieval *mappa mundi* showed the Garden of Eden and a place where tribes called Gog and Magog were shut up until the end of the world. Some maps made during this time included images of monstrous animals both real and imagined. There also was widespread disbelief that there could be another side

of the earth to the south ("the Antipodes") because obviously men would have to walk upside down.

The largest, grandest maps that took up an entire oxhide or more have mostly been lost. After their use had run out, some were cut up to make book covers or other documents. One that still exists hung on the wall at Hereford Cathedral. If this map is typical, the grand *mappa mundi* also included commentary about the world and its history. Sri Lanka, here called Taphana, has a legend stating that it has two winters and two summers, dragons, and 10 cities. Some places have notes explaining the strange customs of the residents, such as placing newborn **babies** in a snake pit or willingly committing suicide off a cliff. The places have no bearing on realistic size, shape, or even relative placement, but they were brought alive with pictures and notes.

There are more than a thousand known smaller *mappae mundi* of the type commonly known as T-O maps. They were abstract and theological in form and intention and often were drawn by a bishop, a monk, or some other churchman. In these maps, the three known continents of that time (Asia, Africa, and Europe) were drawn within a circle surrounded by a ring of ocean (the *O*). Within the circle, two bands of water formed a *T*. The top of the map pointed east, toward the Orient; from this practice we get the word *orientation*.

In the typical T-O map, the top land represented Asia, with a horizontal band of water below to show the Don and Nile rivers, which were seen as Asia's border. The triangle of land in the lower left was Europe, and in the lower right, Africa; the water between them was the Mediterranean

One of the best-preserved mappaemundi is in Hereford Cathedral. The map was a highly inaccurate representation of the world's geography, but it accurately summarized the way Europeans viewed the world as a concept. (Hereford Cathedral, Herefordshire, UK/The Bridgeman Art Library)

Sea. The waters make a Greek *tau,* a form of the cross that early Christians used in times of persecution because it was less conspicuous than a Latin cross. There was no attempt to make the land's shape anything more than abstract.

The maps were often decorated, sometimes with little heads with puffed-out cheeks symbolizing the winds, sometimes with a picture of Jerusalem in the middle. On some maps the continents were named for Noah's three sons, Shem, Ham, and Japheth. Others were heavily decorated with symbols or pictures.

Road Maps

The earliest known forerunner of any kind of road map was a **pilgrim** guide written by an unknown traveler around A.D. 330, the *Itinerary from Bordeaux to Jerusalem.* A sort of map in prose, it gave the pilgrim necessary information about places and distances along the way, with detailed descriptions of hostels and places to change horses or donkeys. It had no real map, only a travel guide. Later pilgrims' guides included maps, but they came in the form of a strip of road to be unrolled along the journey.

The most famous road map still extant, the Peutinger Table, is a 12th-century copy of a late Roman map. It is 22 feet long but only a foot wide; it was made by sewing many pieces of parchment together. It showed all the public roads, Roman settlements and **cities,** and parts of Asia, including India, Sri Lanka, and possibly China. Roman roads were still in use in medieval times; for the most part, they were well built. The strip map shows distances, along with places the traveler will be coming to. Roads are shown in strips of countryside illustrated with towns and other landmarks like mountains and forests; long green strips represent rivers and other bodies of water. Both the countryside and the bodies of water are flattened to show roads as continuous.

Maps of specific countries were not much needed, since people knew their own locales or depended on written descriptions of property lines and so on. One exception is a landmark map of England, made around 1245. The mapmaker was Matthew Paris, an English Benedictine monk and a skillful historian and artist. His best-known work is *Chronica Majora* ("Major Chronicles"), an account of European events from 1235 until his death in 1259. His chronicles included illustrations of people and places, architectural drawings, scientific diagrams—and maps.

Among the maps of Matthew Paris is an itinerary strip map of the same type as the Peutinger Table. It showed roads, distances, and towns between London and Apulia, a region of southeastern Italy on the Adriatic Sea. He also drew a map of the Holy Land, oriented with east at the top, reflecting the era of the Crusades. His map shows Acre, a city held by the **Crusaders,** as

Matthew Paris's map of England, Wales, and Scotland was Europe's first modern geographical map. Although portions of it are inaccurate, the well-traveled places near London are accurate enough to help guide a traveler. (The British Library/ StockphotoPro)

larger than Jerusalem or Bethlehem; pictures of buildings, **animals,** and ships are scattered around the map, along with inscriptions in French and Latin.

Paris's landmark national map of England and Scotland was a type of map not yet really in use. Part of the last of Paris's chronicles, *Historia Anglorum* ("History of England"), this illuminated manuscript map has many features we look for today. It had a detailed coastline, islands and rivers, and names of regions; it named all the cities and towns, symbolizing them by **castles** and churches. It even showed Hadrian's Wall, the old Roman fortification, along the Scottish border. Paris's map of England may have been the first to place north at the top. That the map is not to scale (England is too wide and not long enough north to south) is due to the page size available at that time.

Late Medieval Sea and Land Maps

Portolan sea charts were not true maps, but they were perhaps the most practical and heavily used of all medieval maps. They were sea charts made by ship captains to give information about the point-to-point or port-to-port direction to sail. Portolans also usually showed very detailed information about coastlines; they indicated dangerous places such as reefs and shallow water and noted places where supplies and fresh water were available. They were especially useful in the Mediterranean Sea.

Sea charts influenced land maps during the 14th century, especially in Mediterranean seagoing places. Maps made in Portugal, Spain, and Italy could not ignore the accurate shapes of the land and water as shown on portolans. During the 14th century, some maps were produced that were a compromise between the traditional Roman-Christian world map and the observation-based sea charts. The 14th century was also digesting the revelations of Marco Polo, the first European traveler to spend ample time in China and then return. Polo's geography provided names and descriptions that were based on both his own observations and Asian, not Roman or Biblical, tradition. He estimated distances and described the relative placement of these new cities and islands. Asia was clearly larger than the old maps had shown, and it began to appear possible that the old maps were wrong about other places. There was renewed interest in observational geography.

The Catalan Atlas of 1375 was commissioned by the king of Aragon as a gift for King Charles V of France. It was the most complete summary of medieval geography in its time, and it represents the blend between traditional world map and accurate sea chart. The atlas was produced by Abraham Cresques and his family of renowned chart makers, Catalonian Jews who worked in Majorca. The atlas was painted on a series of vellum-covered wooden panels. The first part of the atlas gave information about the **calendar;** the sun, moon, and planets; the signs of the zodiac; tides; and how to tell time at night. The rest of the atlas was devoted to world maps painted

in brilliant colors. South, not north (or even east), was placed at the top, so China was on the left and the Atlantic Ocean was on the right. Marco Polo's reports influenced the mapmaker to include more accurate Asian places, but there were still colorful figures showing traditional characters like Alexander the Great and Prester John (a legendary Christian king in a remote place). The Catalan Atlas does not, however, include the Garden of Eden.

In 1397, a copy of Ptolemy's *Geography* arrived in Florence from Constantinople. For a time, these maps influenced European world maps. Ptolemy's work explained the concept of projecting a spherical world onto a flat map using lines of latitude and longitude. There had been a few grid maps in the 14th century, but the concept of using measured latitude and longitude to create an accurate flat map was new. Maps in the 15th century blended Ptolemy's accurate method with Ptolemy's outdated information. Maps began to shrink the Holy Land to a small area and have closer estimates of distance. Europeans had firsthand knowledge of places such as Norway that Ptolemy could only estimate. They could criticize the old maps and began to recognize that their own maps could be inaccurate. From this time, world maps began to be recognizable to modern eyes.

See also: Compass and Navigation, Pilgrims, Roads.

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Masons. *See* Stone and Masons

Measurement. *See* Weights and Measures

Medicine

Medieval medicine was a blend of old beliefs and traditions from classical times, the herbal traditions of the Franks, Saxons, and other Germanic

tribes, faith-healing superstition within the Catholic **Church**, and a slowly growing body of practical surgical and medical knowledge. Roman medical knowledge was best captured in the works of Galen, the leading physician in second-century Rome. During the Middle Ages, no medical schools departed from the framework of Galen and of Aristotle.

The fall of the Roman Empire to the invading Germanic tribes was a setback to the development of medical observation. Among the Visigoths of Spain, for example, physicians were considered low-ranking tradesmen. They were poorly paid, and they were fined if a patient died. To the East, the Byzantine Empire continued to practice Roman-style medicine but did not add any advances to medical literature, in spite of great wealth and civilization. The first official establishment of physicians in Europe came with the Rule of Saint Benedict, which required Benedictine **monasteries** to grow medicinal herbs and to admit sick lay people as well as treating sick monks. These monasteries were the first **hospitals** and began a long European tradition of religious oversight of medicine.

In the later Middle Ages, the Pope forbade monasteries to treat the sick outside their communities. Some secular hospitals had been established by then, often originally for the housing and care of **pilgrims.** Secular physicians, sometimes trained at **universities,** operated in large towns and **cities.** Sick people were still most likely to remain at home.

Faith in Medicine

Medieval beliefs emphasized the role of the supernatural in healing. Every healing was a miracle, in a way, since any sickness or injury could bring death. If someone prayed to a **saint** and got better in the course of nature, the saint received the credit. This makes no sense to postmedieval minds, but they lived with a constant awareness that death could come at any time.

Saints' special standing in heaven permitted them to ask favors of God, and they were thought to have a keen interest in ailments or problems related to their own lives or deaths. Saint Apollonia's teeth had been knocked out during her torture and martyrdom, so people with toothache called on Saint Apollonia. Saint Agatha's breast was cut off, so all issues having to do with breasts, from breast-feeding to infection to cancer, were under her care. Throat disease and choking came under the care of Saint Blasius, who had saved a boy from being suffocated. Many diseases were named for the saints who looked after them. Hookworm was Saint Gothard's Disease, gout was Saint Maur's Disease, and rabies was Saint Herbert's Disease. Measles was Saint Lazarus's Disease, and cancer was Saint Giles's Disease. Remedies, too, were named for saints, such as Saint Jacob's oil and Saint Bartholomew's tea. There was nothing systematic about these

names; some diseases were called by the name of more than one saint, just as some saints took care of more than one disease.

Sometimes, the sick were brought to the shrines of either local saints or the saint thought most likely to help. **Relics** from the shrines could also be brought to the sick. The original relics were fragments of bone from the saint in question; the skeleton of Saint Margaret was held by the queens of France and was brought into the room in its reliquary when a queen was due to give birth to a baby. Relics could also be derivative, such as dust from around a tomb or **cloth** that had been held in the presence of the relics. There were also saints' medals. A medal of Saint Benedict, founder of the monasteries, had great healing power in the eyes of medieval people, since he was the patron saint of all disease.

Prayers to the saints, or special charms invoking saints' names, were part of other remedies. A physician might prescribe a remedy like theriac or ginger, but it had to be taken with certain blessings or prayers. Saints could work through herbal or **spice** medicines, but it was dangerous to proceed without any prayer to the saints at all.

Medical Theory

Medieval medicine was based on Aristotle's idea, also endorsed by Galen, that there were four humors, or temperaments, in a body. These humors were expressed in both mind and body, in both personality and health. An imbalance in humor resulted in disease. Aristotle also divided the world into four elements: air, fire, earth, and water. There were also four qualities of things: hot, cold, dry, and wet. Air was considered hot and wet, while fire was hot and dry, earth was cold and dry, and water was cold and wet. The four humors of the body were based on the same system.

The four humors were liquids thought to exist in the body: blood, phlegm, yellow bile, and black bile. A temperament majoring in blood was called sanguine and was hot and wet like air. A body producing more phlegm was phlegmatic, and it was cold and wet like water. Yellow bile was warm and dry like fire, and its temperament was choleric. Black bile was cold and dry, like earth, and its temperament was melancholic. If the body produced too much black bile, the result would be a gloomy personality, along with a physical tendency to coolness and dryness.

Imbalance led to disease. The imbalance might come from diet or bad air. It might come from bad habits of living. The physician's job was to examine the patient, determine the patient's basic body temperament, and decide what had gone out of balance. Measles, for example, was a hot, dry disorder because it involved a high fever. Other illnesses might be hot and wet or cool and dry. Diet, medicine, and other practical remedies were prescribed to regain the proper balance. The system was not factually correct,

but it was very consistent and logical, and it was not until the discovery of microbes that it was displaced.

Medieval doctors had to make a careful examination of the patient in order to diagnose the imbalance. Feeling a patient's pulse showed the doctor the state of the heart, and examining urine provided discoveries about the liver. Every good medieval doctor carried a urinal to take a sample from a patient; they were attentive to color and smell. One of the leading medical textbooks of the time was *De Urina* ("Of Urine"), a careful catalog of the many observations and diagnoses based on urine.

Aristotle was known to medieval medicine only through the work of Avicenna, who translated the works of Aristotle into Arabic. It had become difficult to find Greek manuscripts or people who could read Greek, but since Arabs and **Crusaders** mingled at the edges of Europe, such as on Sicily, it was not as difficult to find monks who knew both Arabic and Latin. Avicenna and other works brought Aristotle back into Latin. With the Arabs came astrology, the science of the stars. A patient's horoscope could determine diagnosis, since the positions of the stars and planets showed the disturbances in the earth's atmosphere. Astrology seemed very scientific at the time because science was more closely connected to philosophy than to observation. Only a university-trained physician could diagnose with astrology.

A certain amount of medieval medical care came from an accumulation of practical experience. Infected wounds could be improved with a hot poultice; spiderwebs stopped bleeding. Medieval medicine also recommended bleeding to remove excess or infected blood or to restore balance. Physicians debated how much bleeding was effective, such as whether it was better to bleed a patient until he became unconscious. Different schools of thought taught variations, but everyone believed bleeding gave a patient relief. Physicians managed bleeding until the 11th century, when barbers began to do it. Physicians also cauterized wounds or diseased tissue by burning them with a hot iron.

Balanced Diet

The medical science of **food** was based on the idea that foods were either hot or cold and either wet or dry. The cook or diner was to strive for balance to maintain the body's natural state of moderate warmth and wetness. Medieval understanding of the stomach was that it cooked the food. The stomach, therefore, must be kept warm. Its fires should not be drenched with too much water or cold food.

Different foods were considered to take part in one of the four elements of the earth (fire, air, water, and earth). Most spices were considered hot and dry. Fruits were both wet and cooling, and medical practice saw fruit as

wholesome only when cooked and served with spices to balance these qualities with heat and dryness. Many medieval recipes were created from medical assessments that a certain meat or fish was cooling or dry and needed balance from particular spices. Too much heat would bring on fever, while too much cold would bring depression and cold illnesses.

Pork was cool and moist; beef was cool and dry. Pork must be spiced heavily, while beef also needed moisture. Because birds flew in the air, they were considered warm and dry; they were not spiced, but rather were served with a cooling, moist dish. Lamb was warm and moist, which could imbalance the body, and its consumption was discouraged. (The traditional British accompaniment of mint jelly with lamb could be a last holdover from a medieval cooling recipe.) **Fish** was cold and wet, like the water it swam in, and so fish was served with a great deal of pepper and other hot spices. Lampreys, a type of eel, were considered very cold and wet; they were soaked in wine, roasted, and spiced so that they were as hot and dry as possible.

Foods were often labeled unwholesome without regard to modern ideas of bacteria or poison. A food might be unwholesome for a particular individual but not for others. Physicians ordered patients to follow restrictive diets that would not make sense to modern dieticians. A man with a naturally melancholy temperament was told to avoid cool, dry beef, which would exaggerate his cool, dry humor. Instead, he would be advised to eat birds and take spices. A man with a hot temper would be advised away from spices, which might lead to overheating diseases such as fever. A cowardly man of cool blood should drink warming alcohols to put a hotter spirit into him. Old men needed warming and should take spices; young men needed a cooling, moist diet. Seasons also needed to be balanced. The cold of winter required pepper and cloves, and meats had to be hot and dry (such as chicken) or spiced.

Aristocratic households included a spicer who oversaw the preparation of balancing sauces. In consultation with a physician, the spicer prepared a meal balanced between hot and cold and between wet and dry for the lord's constitution. Some paintings of royal **feasts** show the king's physician standing behind his chair, supervising what the king could eat. After a meal, whole spices or spiced wines prepared for digestion, since the stomach had to be kept warm. Candied ginger was a favorite dessert for the aristocracy.

Diseases

Medieval medical books were filled with accurate descriptions of diseases. Most went by different names from today's diseases, but some, like leprosy and malaria, bore names that continue into the present. Diseases

were named for saints, by description, or, at times, by what was thought to cause them. Cancer, especially breast cancer, was known. Physicians believed cancer was caused by demonic crabs inhabiting the flesh, and they tried exorcism but could not cure it. The word *cancer* comes from the Latin word for crab.

There were many common ailments such as toothache, headache, stomachache, and wound infection. Irritable bowels, vomiting, diarrhea, and lung disease were known. There were also many common wounds that had to be treated surgically, especially on the battlefield. The most common ailment was childbirth, which is not a disease, but it had a very high rate of mortality for both mother and child. Medical books discussed the proper way to deliver a baby when its head was not positioned correctly downward.

There were also many infectious diseases that came in epidemics. The most famous is the Black Death **plague** of 1347. This disease broke out of Asia for the first time and became a returning epidemic all through the Renaissance. Many less famous epidemics came and went before it.

Saint Anthony's Fire was an infectious disease characterized by red skin, high fever, and sores. Sometimes the name may have described shingles, a painful but not fatal sickness, but its more serious form involved infected sores that quickly became gangrenous. Some victims lost limbs, and many died quickly. The epidemic returned at least six times.

Smallpox and measles both caused fever and scarring blisters called pocks (or pox), and both were treated by bleeding and careful administration of diet. Smallpox came to Europe when Crusaders returned home from Asia, and it spread during the 13th century. Diphtheria, an infection of the throat, caused death by suffocation or dehydration. Cholera and dysentery, infections of the intestines, also came in epidemics. Malaria was known as well, and although medieval physicians did not know it was caused by a parasite transmitted by mosquitoes, they were sure swamps transmitted it. They attributed it to bad air, leading to its name, *malaria*. Syphilis was another serious infectious disease that was often fatal. It was misdiagnosed as leprosy, but medieval physicians recognized that it was sexually transmitted, while true leprosy is not.

Tuberculosis had been well described by the Greek physician Hippocrates in classical times, and it was one of the most pervasive infectious diseases. Sometimes it was called the wasting disease (or later, consumption), because patients wasted away to skeletons while coughing up sputum and blood. The only known treatment was to go to a warm, dry **climate,** but most patients could not afford this, and most died. Tuberculosis could also attack the spine or settle in the lymph nodes of the neck. The medieval name for the lymph disease was scrofula, or King's Evil, and many came to believe the touch of a king could cure it. Most

medieval kings had special days when they touched people who had King's Evil.

Leprosy was another common infectious disease. It was an incurable skin condition in which white or red blotches broke out over the skin, leading to rotting and either a distorted appearance or a loss of limbs. At times it was overdiagnosed, since it was a disease people particularly feared. Some diagnosed lepers may have suffered from other skin diseases, and reports of lepers getting well may indicate these cases. There was no treatment for leprosy. Lepers were isolated and were legally considered dead. In some places, there was a ritual **funeral** for a leper, in which a priest said the prayers for the dying and the family accompanied the leper to a grave, where the priest threw some dirt on him. Even without this ritual, lepers could not form legal contracts or inherit property. They lived in separate leper houses or colonies until they died. Strict quarantine may have helped stop the spread of leprosy; the peak may have been around 1400, when France had as many as 10,000 leper houses. It became a less serious problem in the Renaissance.

Although medieval doctors had no theory that could account for infectious diseases, they began to know by experience that some illnesses could be transmitted by air or touch. Recurring epidemics of the plague, throughout the 14th and 15th centuries, made this observation even more important. Some physicians wore protective goggles and facemasks when visiting plague victims. They recognized that rooms with an open window were safer than closed, stuffy rooms, and they recognized that gloves should be worn when touching an object such as a patient's urinal. They also did useless things like keeping rose perfume near their noses. By the time the plague had returned several times, 15th-century cities began passing quarantine ordinances. If a traveler came from a plague region, he had to stay 40 days in an isolated place like an island.

Remedies

Medical works from the ancients had included ingredients such as ground earthworms, dog excrement, and dried cicadas. However, most medieval prescriptions seem to incorporate less exotic ingredients, like wine, vinegar, and other herbs. Opium had been known since Roman times, but it was not widely available. Some medieval medical books recommend it, particularly those from the Byzantine East or the Arabic lands, where it was more likely to be available.

Physicians took seriously their duty to prepare medicines for the sick. They used a mortar and pestle to grind herbs and spices very finely. An eyecup was a mixer for creating salves for treating eye infections. Physicians may have had their own stock of spices and other ingredients or at times may have drawn on the resources of the household.

Prescriptions made by physicians were not available to the poor. The poor used garlic and wild herbs as medicine. Earache was cured by dripping warm goose fat into the ear. Vinegar stopped bleeding, helped toothache, and treated burns and infection. As pepper slowly came down in price, it too was used as medicine by common folk. Honey, a widely farmed substance, was used in salves for eye and skin problems. Although it was available in every region, it was too expensive for the poor.

The most important medicine in the Middle Ages was theriac, an antidote to poison. Theriac could cure not only poisonous bites, but also other diseases where **poison** could be involved; considering the mysterious nature of disease, poison could be involved in infection, plague, epidemic, or migraine. Theriac came to be a cure-all. There were many recipes for theriac. The name did not indicate the ingredients, but rather the purpose. Its most common ingredient was the flesh of a poisonous serpent, on the grounds that it would counteract the serpent's venom. It could include herbs, honey, yeast, nut oils, spices, and the dried flesh of other poisonous creatures such as scorpions. Theriac was supposed to be mixed carefully and then aged for at least a year. Adults could ingest theriac, but it was considered too strong for children, who could only have it rubbed on their skin.

Medicines for the wealthy were based on spices. Spices were part of rebalancing the body's humors, and they had the added benefit of being very costly and therefore presumed to be very effective. All spices had been rated by physicians on a scale of one to four for how hot or dry they were. Pepper and cinnamon were the hottest; they were emergency medicine for cold and wet illnesses. Ginger and galangal were considered hot and wet and were used for illnesses that appeared cold and dry. While a fever itself might be hot, at times the physician decided that its true cause was coolness in another part of the body, such as the stomach. So fever could indicate a cooling illness. Overall, pepper and cinnamon were the most common medicinal spices.

Nutmeg was a popular remedy for stomachaches or gas. It was not considered hot, but it was very drying. Roger Bacon, writing in the 13th century, recommended cloves, nutmeg, and mace for the dangerous cooling of old age. Because poison was considered a cooling process, spices were also viewed as antitoxins for poisoning and were key ingredients in many theriacs. Pepper and ginger had both been used this way since ancient times.

The fact that these medicines were generally ineffective did not make people stop believing in them. Sometimes they appeared to work, and for common ailments, especially of the stomach, spices can help. Ginger helps with nausea, but it cannot help with poisoning or cancer of the stomach. Because spices helped sometimes, and because they were exotic, expensive, and endorsed by the sages, medieval patients who could afford them continued to believe in their powers.

Pepper was a central ingredient in medieval medicine. It grew in the Far East, where it was harvested and dried. The pungent black berries seemed a perfect agent for warming the body. Classified as hot and dry, pepper had to be mixed with some wet foods, and it was the best medicine for any illness considered to cool the body. Migraines were caused by a cold brain, so pepper was sometimes administered through the nose. (Antonio De Azevedo Negrão/Dreamstime.com)

Spiced medicines were not always taken by mouth. The cooling brain disorders of epilepsy, mental illness, and vertigo had to be addressed by putting medicine as close to the brain as possible, which meant into the nose. Disorders of the eyes, which were considered cool and wet, were treated by salves put directly into the eyes, and their remedies had to be hot and dry, which often meant pepper. Pepper was also packed into the anus to cure intestinal diseases. Gout could be treated by applying spices to the skin of the afflicted area.

Because spices were so costly, spicers were tempted to mix in cheaper substances or say that domestic herbs were imported in order to drive up the price. Spices were medicinal, so this practice was considered criminal. There were harsh penalties against falsifying or adulterating a stock of spices. Physicians worked with certain trusted spicers—or apothecaries, as they came to be known. In some cases, they worked together to keep prices high, especially for wealthy patients.

From ancient times to modern times, and including the Middle Ages, the chief culprit for the spread of infection was thought to be bad air. Bad air was night air, which was cool and wet, as well as the air of certain places where disease lurked. Bad air usually smelled bad, just as disease and death smelled bad. Good air was dry, warm, and good smelling. People sought to live in places of good air and avoid places with bad air.

Spices were a popular way of warding off infection caused by bad air. When the plague broke out, the rich used mixes of spices, such as cinnamon,

cloves, saffron, myrrh, and mace. These were carried around in pomanders, burned in the house to fumigate it, or just strewn about the house. Poor people carried sweet-smelling flowers or burned herbs and fragrant wood in their homes to rid them of bad air. Onions had a potent smell and were obviously healthful, so planting onions could also draw bad airs away from a house.

The word *pomander* came from French—*pomme d'embre,* an "amber apple." It was originally a lump of ambergris, a substance found in the digestive tract of sperm whales. Ambergris has a pleasant, musky odor and is solid, waxy, and flammable. It has historically been used as incense, perfume, spice, and medicine. A lump of ambergris could be worn on a chain; people believed that its healthful odor would ward off the bad airs of a plague. During the Middle Ages, many pomanders were lumps of wax with aromatic spices embedded in them; the wax was enclosed in a metal or **pottery** container hung on a chain. Physicians often carried pomanders as they made rounds to the sick.

For sexual dysfunction, physicians also recommended spices. A high libido was hot and dry, while fertility was hot and wet. For increasing sexual desire, physicians prescribed pepper, cinnamon, and nutmeg. Medieval newlyweds could be served a drink much like eggnog, seasoned with cinnamon and nutmeg. For fertility, ginger was best, since it was rated as both hot and wet. Cloves were second best. Physicians warned against taking too many spices because they might dry and heat the constitution and produce both excessive desire and other types of disease, such as fever. The coldest and driest herb was agnus castus, native to the Mediterranean. Some monks, who wanted to dampen sexual desire, used this as seasoning.

Surgery

Surgery was not considered on par with real medicine, although some physicians and surgeons argued that the two could not be separated. While most people who were seriously injured simply died, battlefield surgeons began to form useful practices for saving lives where possible. The basic surgeon's kit began with his bag to carry the instruments. He carried a sharp knife for cutting veins or doing other surgery, a probe to examine wounds, and a cup for drawing out infections. Some medical **books** discussed surgical methods, so we know how some surgeries were performed, but they were not routine procedures. Wounds often became infected, and it was difficult to control for a good outcome.

Military surgeons dealt with many head wounds at **tournaments.** They became adept at identifying which skull wounds could be bandaged and healed and which were fatal. They learned to bore a trephine hole into the skull to relieve inner pressure from blood or other fluid. Sometimes they used a short piece of **silver** pipe to press into a wound containing a barbed

arrow; this caused the arrow to be enclosed in metal, and the barbs would be released. They also dealt with serious wounds in which intestines spilled out; they learned how to clean them, replace them into the abdomen, and keep the wound open with a drain until it healed. They treated gangrenous wounds with amputation. The patient had no painkiller, and the wound was cauterized afterward.

In the case of women who died in childbirth, sometimes surgery was attempted to rescue a live **baby.** However, male doctors were not permitted to attend at births, and midwives only rarely attempted surgery. Stones in the bladder could be cut out by being pressed to the surface so that a small incision and scoop could remove them. A stone caught in the urinary tract of the penis could similarly be pushed closer to the surface and removed with a small cut that would heal. But surgery was rarely used to treat other diseases. Methods of stitching the patient and keeping the site from infection were primitive.

Cataracts, a common eye affliction, were treated by traveling cataract surgeons who popped the bubble in the eye with a needle. Vision returned immediately, but the long-term outcome was not good; the patients eventually went blind.

By 1300, there were advances. Some teachers from a school of surgery at the medical school of Bologna established a similar surgeon's college in Paris. One of its leading surgeons instructed doctors to use waxed thread to hold blood vessels together to stop bleeding in a serious wound. Surgical sites and wounds began to be sutured. Some began to instruct that a wound should be washed in wine, which was a simple disinfectant. They had no understanding that bacteria cause infections and die in alcohol, but they considered wine a healthful, clean liquid, and those who tried it found that infection was less common.

Guild-trained surgeons and the rare university surgeons were mostly in large towns and cities. University-trained surgeons, in fact, could refuse to actually do any surgery. In small towns, surgery was usually performed by a barber, because he had the tools. Barber surgeons removed teeth, opened abscesses, did bleedings, and eventually set bone fractures and did simple operations, such as for stones in the bladder. Barber surgeons in England began their own guild in 1302; it was chartered by the king during the 15th century, recognizing their right to practice and train in surgery. They conducted their own lectures and dissections.

Medical Training

The innovation of medical schools at universities began a transition from ancient into modern practices. One of the best-known works of the old medical tradition of Europe was the "Leechbook of Bald," written in

Anglo-Saxon around the year 900. Bald collected the classical knowledge available in his time but largely recorded many folk remedies. Some of these remedies are shockingly wrong, such as applying dried human feces to a cancerous wound. Bald recommended warding off a poisonous spider bite with a drink of ale, raw egg, and sheep's turd. Some remedies were charms to speak over the sick or rituals to enact using dirt from a grave or cow's milk, but without any real medicinal intent. Some were home remedies that may have helped, like pennyroyal tea for an upset stomach. Such traditional compilations preserved some useful herbal knowledge, but they were superstitious and unscientific.

Even at universities, medical training emphasized authority over innovation. The main task for a student at a medical school was to memorize the traditional and accepted works: Hippocrates, Galen, and Avicenna. Some schools featured dissections, but many did not expect students to observe real patients.

Some medical books of the Middle Ages discussed ideas such as the four humors and which foods to eat for certain diseases, and some mostly

Since medieval hospitals only cared for the poor, the heart of medical practice was the home visit. A physician visited his patient each day and made a care examination. He studied the patient's pulse rate, skin, and urine. After the exam, the physician held a consultation, often out of the patient's hearing. He gave instructions for diet, rest, and medicine. The sick person's family and friends were responsible for carrying out medical orders, while the physician himself rode to the next house. (National Library of Medicine)

rehashed Galen and Aristotle. Most included at least some eyewitness descriptions of diseases and injuries, and some had practical manuals for diagnosing diseases and treating wounds. Some provided surgical instructions or discussed the common problem of delivering babies safely for both mother and child.

The leading medical writer of the Middle Ages was a Persian doctor named Ibn Sina, better known in English as Avicenna. Combining Galen's teachings with Islamic medicine, he interpreted Aristotle's system of the four humors and added his own observations. Avicenna's work came to Europe as interpreted by a rhyming poem written in Salerno, Italy, the home of the first medical school in Europe, which was renowned for its work in healing injured or sick Crusaders.

The physicians of **Muslim** Andalusia wrote medical books that were eventually translated into Latin. The Koran prohibited dissection, so Arabic medical writing lacked direct observation of anatomy. Male physicians were prohibited from treating female patients and had to rely on the observations of midwives in writing about female diseases. Abulkasim, court physician for Caliph Abd al Rahman III, wrote a lengthy book on surgery that described his observations and experiments. He operated on the thyroid, removed kidney stones and tonsils, and extracted arrowheads. He described many case histories. Abulkasim's work became standard in European medieval medical schools.

The **Jewish** doctor Moses Maimonides was originally from Andalusia but was driven out when his family refused to convert to Islam. His medical books were written in Arabic while he was living in Egypt. He derided superstition such as astrology and was an active, practical doctor who saw thousands patients in the Sultan's palace and in his home. He included his own observations as he summarized the medical knowledge he had been taught.

Most medical books dealt only lightly with surgery. The only influential medical book that came out of the Byzantine Empire was by Paul of Aegina and was written around 600. Paul wrote extensively about surgery, and his work was used in many medical schools. Another influential surgery textbook was the *Practica Chirurgerie* by Roger of Salerno. This work, written around 1200, described diagnosis and treatment of head injuries, broken bones, bleeding, epilepsy, and goiter. Roger of Salerno recommended cauterization to stop bleeding and iodine-rich seaweed to cure goiter. He suggested treating a badly healed broken bone by breaking and resetting it. He described suturing wounds and even blood vessels and recommended allowing a wound to become infected and to heal with wet dressings. It was probably nearly impossible to avoid infection during the time. Other surgical experimenters and writers, though, recommended washing a wound with wine to avoid infection.

Medical schools at universities in Padua, Bologna, Salerno, and Paris were the top schools. Salerno was founded in the 10th century, near the famous monastery of Montecassino. It remained as a functioning medical school until 1811. Salerno blended the medical traditions of Arabs, Jews, Greeks, and Latins. It relied on the incorrect theories of Galen and Aristotle, but it rejected superstitious remedies and taught students anatomy with dissection. The school issued the first modern anatomy book, based on dissections of pigs, and stated that pigs are the animals most similar to humans, although they do not look as similar as apes do.

Physicians who spent the required time studying, and who passed their exams on the medical books, took the Hippocratic Oath. They became the top echelon of medical practitioners. Some went on to innovate and teach at medical schools, while others became court physicians who refused to get their hands dirty but preferred to give orders to others.

See also: Food, Gardens, Hospitals, Plague, Spices and Sugar, Universities.

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Menageries. *See* Zoos

Mills

Harnessing **water** and wind was one of the major achievements of medieval Europe. Water and wind technology had appeared in other parts of the world, chiefly in China, but there is little evidence that this power was

used for things other than grinding grain until medieval Europeans began experimenting. In medieval Europe, wind and water powered an industrial revolution. By the end of this era, harnessed natural power had been applied to nearly every manufacturing process.

The mill was a central part of every community. Every grain-growing place (nearly all of Europe) required a mill nearby where farmers, usually peasants, could bring their grain. Millers rarely owned the land they built on; they paid rent to the landowner in flour, cash, or eels from their millponds. Their income was taken straight from the grain brought to them. They kept a portion and sold it for profit. Since peasants could not watch or control the milling process, they were dependent on the miller's honesty. Many medieval stories, including Chaucer's *Canterbury Tales,* depict millers as cheats. It seems likely that most peasants believed the miller had kept more flour than he was due much as modern people often believe car salesmen have cheated them.

Water Mills

In Roman times, waterpower was limited to grinding grain. Romans had **slaves** for other work and did not look for mechanical substitutes. In early medieval Italy, mills at first remained tied only to grinding grain, though, in the later Middle Ages, northern Italy became heavily developed with other industries. In **Muslim** Spain, waterwheels did not develop beyond the primitive level. Water mills ground flour and lifted water into irrigation channels but were never exploited for other industrial uses. For water to become a real industrial force, rivers had to be plentiful and swift.

Northern Europe had much more favorable rivers for water mills. Mills were well established in Frankish lands by the time of Charlemagne, whose laws protected mills. They also were used in Anglo-Saxon England. These early mills could have been horizontal-wheel mills, copied from the Roman ones. Archeological evidence suggests that the horizontal wheels were closer in size to a large cartwheel than to a 19th-century waterwheel and that they were fed water directly by a wooden pipe leading from a millpond at a higher elevation.

Small horizontal-wheel mills operated at the margins of Europe throughout the Middle Ages. These primitive mills are usually built over a small stream, and a shaft sticks below the building into the water, where a small turbine is mounted. Primitive mills like this, found in Scotland, Norway, Romania, and parts of Bohemia, may have been maintained by the community. Each user ground his own flour; there was no professional miller.

In France and England, though, the mills were larger operations and required professional millers. These millers paid rent to the landowners, often

The Luttrell Psalter appears to show an overshot, vertical waterwheel on a small rural mill. A country mill like this was probably used for grinding flour, but mills in larger towns were built to serve many other crafts. (HIP/Art Resource, NY)

in the form of flour and eels. The standard arrangement for the miller was to grind a farmer's grain and keep a portion of the product. He could sell it or use it for his rent. Manors had their own mills, too, where the lord's own grain was processed. **Monasteries** often built mills.

During the 13th century, mills in Northern Europe changed to using vertical wheels. Vertical wheel development added much more power to waterwheels. The medieval water mill could grind far faster and more efficiently than the horizontal-wheel mill. They were then adapted into complex power trains that could run many other machines.

Vertical wheels had many slats, or buckets, for the stream to push against. The first wheels were designed as undershot wheels; the stream passed under them, pushing the slats forward and up. Later medieval mills used overshot wheels, but these required a natural waterfall or significant engineering to create a source of falling water. Only overshot vertical wheels could produce enough power for the many industrial uses that water mills were soon applied to.

The power train depended on wooden gears, chiefly to turn horizontal power into vertical power. Simple medieval gears were wheels with wooden or metal teeth; wooden gears made with wheels and pegs were the most common, although they broke easily. Using the heaviest gears to transfer

power from the waterwheel to a drive shaft, power trains could add more gears along the way to drive additional **machines.**

Waterwheels drove hammers that beat on **cloth** for fulling or crushed metal ore, olives, paint pigments, linen rags for **paper** pulp, or grain mash for beer. **Armor** makers used waterwheels to run polishing wheels, and carpenters used them for wood saws. Blacksmiths built larger ironworks because waterpower could drive large bellows tirelessly, and this increased firepower heated the **iron** to the higher temperatures needed for steel and pig iron.

Cistercian monasteries always included a stream diverted through the main building, first to turn waterwheels to power the monastery's work, and then to flow through **latrines** on its way out. Some Cistercians used waterpower to crush olives or maintain iron forges. The main monastery at Clairvaux, in France, ground and sieved wheat flour, tanned leather, and fulled cloth.

By the late Middle Ages, there were so many water mills operating in France and England that they blocked travel on the rivers. Mill operators built dams and dug channels to alter the river's flow for their advantage, which often affected the conditions for mills downstream. There were bitter lawsuits over new mills when they cut waterpower for other mills. Kings tried to license mills to regulate them.

Towns dealt with the high need for mills by digging millrace channels at river bends. They diverted some of the water from its natural course, forcing it through narrow, straight channels with strategically placed waterfalls. A town with the right site could operate 10 or 12 mills within a short stretch, enabling the craftsmen to power a number of businesses.

Some water mills were located under town **bridges,** while others floated and were tethered mid-stream. There is 12th-century evidence for floating mills on the Seine near Paris and in Venice. There were a few mills that operated with the power of rising and falling tides, but they were not as successful. Waterwheels were not useful in coastal, flat regions where the streams were too slow. Tidal mills could not provide the same power as river-powered mills, but they occurred throughout the later Middle Ages along the coasts of Italy, France, England, and the Low Counties.

Windmills

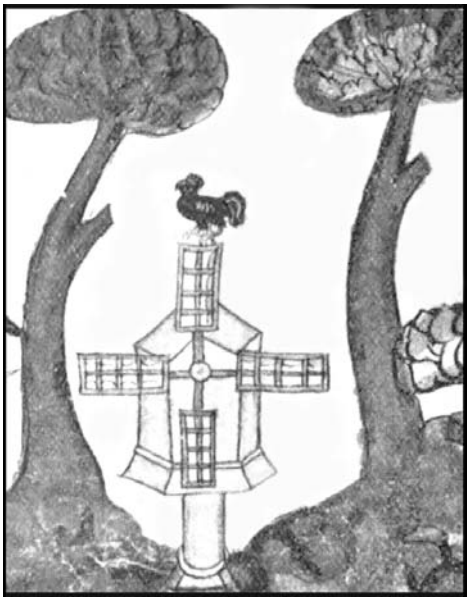
Windmills appear to be a European invention. Although many medieval inventions originated in China or India, wind technology remained primitive in China. Coastal Europeans, who had strong sea breezes but few fast streams, developed windmills as an alternative source of harnessed power. Windmills show up in written records around 1180 in England and Normandy. The technology appears to have spread quickly; during the Third

Crusade (1190–1192), engineers in the Crusader army built the first windmill in Syria.

By 1200, windmills had spread to most parts of Europe. Flanders (modern Netherlands) invested heavily in windmills. Its steady sea breeze was put to work pumping water out of the low-lying land. Windmills powered wheels with buckets that scooped water up and poured it into canals or troughs. Other windmills ground flour and worked other kinds of machinery. The largest number ground wheat and other grains using a pair of heavy horizontal millstones.

Medieval windmills were post mills. The windmill was built around a post that supported the building and allowed it to turn so it could catch the wind from any direction. The mill's central post was supported by four or six cross-trees, large oak legs resting on stone blocks. The central post rose up into the building, and it held a large wheel with a bearing. This supported the mill's floor, which was raised above the ground. Sometimes the cross-trees and post were visible, but often the miller built a housing around them to protect them from the weather. Medieval illustrations show both kinds of design; without a housing, the mill seems to stand on chicken legs, while with it, it looks like a tower that stands on the ground.

Inside the mill, the main floor was supported by beams that turned around the central post, with an upper floor reached by a ladder. The gears and beams were all made of wood, though some edges and joints were reinforced with iron. Millers kept things running smoothly by oiling them with



The original windmill of the Middle Ages turned on a post so that it could catch the wind as its direction shifted. The four large sails were wooden frames covered with tightly stretched canvas, like ship's sails. In this picture from an illuminated manuscript, the miller has placed a weather vane on top of the building. As the wind shifted, he turned the heavy mill by hand, perhaps with the help of an ox or donkey, until the sails had full power. (Richard Bennet, *History of Corn Milling*, 1899)

tallow. The machinery was attached to the axle of the sails, which came into the upper floor. The standard post mill had four large sails. Each sail was made of a wooden frame with canvas stretched across it.

The mill had to be turned on the post so that its sails faced into the wind most efficiently. The mill had a long beam that was used as a tiller to turn it. The beam often had a wheel at the end so it could roll in a circle around the mill, and sometimes it could be hitched to an animal. By the late Middle Ages, some mills had a smaller set of sails mounted on the tiller beam. When the main sails were pointed into the wind, the tiller's fantail was protected from the wind and did not move. When the wind direction changed, the small sails drove the tiller forward, turning the mill into the wind again.

Although most medieval windmills were rotating post mills, later ones had a stationary building. By the 14th century, some mills were built of stone and could house heavier equipment. The sails still needed to be turned to face the wind, but the mill had been redesigned so that only a cap on top needed to turn. The cap was made of wood, and it carried the sails as it moved on a track.

See also: Iron, Machines, Water.

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Minstrels and Troubadours

The entertainers we know as minstrels went by many other names during the Middle Ages. They were *ioculatores* in Latin, players and entertainers, and *gleemen* in Anglo-Saxon England. Their most common name in medieval French was *jongleurs,* which became the modern word *jugglers.* Jongleurs could often juggle, but they did much more. They were the all-purpose professional musicians, actors, and players of the time and could be found at **fairs,** in **castles,** and in **city** squares.

Jongleurs and minstrels were never considered respectable, even in medieval times. They did not mind their own business, like most farmers or craftsmen, but traveled from town to town, performing in the squares. Most of them were relatively poor; they spent much of their time outdoors. The jongleurs in this French picture are standing in the city square. They may be acting out a drama, or they may be telling stories. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

Troubadours, the courtly poets who sang in 12th- and 13th-century Provence, were of a higher class. Most were nobility, and some were noble ladies. *Trobar* meant "poem" in the language of Provence. *Trobadors* considered themselves poets set to music; they created the first important poetry in vernacular speech, rather than Latin. By romanticizing the concept of love, they permanently changed Europe's view of women.

Minstrels and Jongleurs

A minstrel in *Beowulf* makes a stately appearance, singing heroic songs for the king and his men. He was a *scop* (pronounced "shop"), a composer of verse, not just a singer. He accompanied himself on a harp. Scops were honored and seem to have lived at royal halls, though some may have traveled. Traveling singers were known as gleemen and could have learned the songs and stories the scops wrote.

In Charlemagne's time, both in England and in the land of the Franks, there were not only court poets and wandering singers. There were also many other entertainers. They sang and danced, juggled and tumbled, put on plays, and traveled with trained **animals.** The *ioculatores*—players—were

part of a tradition of singers, dancers, and clowns that stretched into Roman times.

There were essentially three categories of minstrels, although the dividing lines are fuzzy. Musicians sang and played many different instruments, and, although they were ranked below the noble troubadours, they were at the top of the general minstrelsy scale. Next were the jongleurs and mimes, who could do nearly anything else. They did literal tumbling, acrobatics such as headstands and handsprings. Some had puppet shows; others wore costumes and acted like animals. Some had trained animals; others had learned **magic** tricks while in the Middle East on **Crusade.** These performers could travel widely, since their acts did not depend on a common language. A third group, the smallest, was made up of dropout scholars. They traveled with minstrels and used their learning to entertain. They were satirists and may have performed essentially stand-up comedy. They may also have been the origin of court jesters.

There is not a large body of evidence for medieval jesters as a separate profession from minstrels. Some halls may have employed midgets or simpletons as fools, but, for the most part, minstrels did all the things that popular belief attributes to jesters. They sang and joked, and they traveled with their patrons. The official court jester with a floppy, belled hat belongs more to the Renaissance.

During Lent, all performances stopped. Some minstrels traveled to the minstrel schools in France, where they exchanged stories and songs. Royal minstrels received licenses to travel. Travel was very important for minstrels, since they had to provide not only the old favorite songs and acts but also new, fresh material. The minstrel school in Paris was the central place to learn new songs, but any foreign travel, even to another region of the same country, brought the minstrel into contact with different songs, stories, and tricks. Minstrels taught each other to play new musical instruments, and they traded the ideas for accompaniment and **dance** tunes.

Minstrels of all kinds used musical instruments to accompany themselves or others. We have some written records of their music, but music notation at that time did not record the rhythm, only the rising and falling pitches. It is hard to reconstruct what the **music** actually sounded like. The instruments were chiefly stringed: harp, lute, and various forerunners of the violin. The lute was plucked (often with a quill), while the vielle was usually played with a bow. The harp became the most common accompaniment instrument, and in the modern imagination it is virtually synonymous with minstrels.

Their music ranged from dance tunes, to bawdy **tavern** songs, to refined epics about the lives of the **saints.** They could also mock or parody important people to please the crowds; alternately, they could flatter great men to receive more pay. The music was not usually complex. It was restricted to

refrains that could be more musical between sections that were recited as stories. The music also provided sound effects to go with the story.

Heroic stories, called *romans* or romances, were among the most popular. Some of the legends of Europe had their start in minstrels' songs; the singers developed new stories about well-known heroes, and in that way the legends grew. The three traditional topics were called "Matter of France," "Matter of Rome," and "Matter of Britain." Matter of France meant the deeds of Charlemagne and his knights, including the "**Song of Roland.**" Matter of Rome meant stories about the ancient heroes, such as Aeneas. Matter of Britain meant the legends of **King Arthur** and his knights. It also included other early British legendary kings, such as King Lear of later Shakespearean fame.

A low form of romance was the popular ballad, a rhymed story in the common language. **Robin Hood**'s legends grew out of the ballads sung about him and other outlaws. Other stories, *contes,* told of lesser-known heroes, knights, kings, and saints. The typical 14th-century story of "Aucassin et Nicolete" told about two teenagers in love, and it alternated singing and telling. The heroes of these contes faced troubles, wandered into far-off lands, and found true love. Minstrels also sang *lais,* which were shorter lyrical songs. Fables, or *fabliaux,* told about human weaknesses and were often vulgar like some of the stories in the *Canterbury Tales.*

Their dress at first was not different from the **clothing** of those around them, but as their profession became more established, minstrels and troubadours developed fancier costumes that made them stand out. They wore brighter colors than other people, and typically they had short hair and no beards. The distinctive jester hat developed only at the close of the Middle Ages at first more as part of a **holiday** tradition than as part of everyday minstrelsy. This hat often had donkey ears, an exaggerated crest like a rooster's, or large droopy points. It was made in garish colors. During medieval times, though, minstrels wore hoods like anyone else, if perhaps louder and more attention grabbing.

Using stage names or chosen names descriptive of their skills, minstrels performed at **weddings** and many other feasts. At royal weddings, there were hundreds of them. They performed in castles and great halls, as well as at public marketplaces and fairs. Some minstrels were attached to the service of a lord, at least for a time, and traveled with him when he attended a feast. At the feast, they entertained in public and were paid by the host. Good minstrels were paid very well by the nobility, and some aristocrats who grew addicted to entertainment impoverished themselves.

The most skilled minstrels were permanent employees of great households. The records of Richard I of England show that he kept some favorite minstrels for many years. They accompanied him to war. Later medieval kings kept large groups of minstrels who could form a small orchestra and

put on plays. By the time of England's Henry IV, the royal minstrels wore livery (a household uniform) and received a regular salary. They were required to play at five major feasts, and most were to be on standby at all other feasts. One reason for the growth of minstrel employment in great households is that the common minstrels gained a reputation for thieving and causing trouble. In the early Middle Ages, minstrels were always permitted to come into any castle or manor, which led to abuses by enemies posing as minstrels. Increasingly, minstrels needed licenses and letters of recommendation. At the close of the Middle Ages, the English king Edward IV set up a **guild** for minstrels to keep impostors out.

Although the best were paid well and could find stable homes in the service of lords, most minstrels walked long distances in all weather. Many were poorly paid for public performances, especially if they had low skills or a lack of connections. Some attached themselves to parties of **pilgrims** to provide entertainment in exchange for provisions and tips. Some performed at saints' festivals and fairs. Minstrels were vagrants by nature, and, by the close of the Middle Ages, cities had begun to license and regulate them. In some periods, minstrels needed written licenses to distinguish them from vagabonds. Most people worked in one place, but minstrels were always on the road. The disguise of a minstrel was popular for thieves and others who wished to be incognito.

The **church**'s attitude to minstrels was usually negative. Money given to minstrels could have been given to the poor, and minstrels encouraged mockery and levity. Individual bishops and abbots welcomed minstrels for their entertainment and news. A small minority of clergy studied the minstrels' ways, borrowing their tunes for the church. Saint Francis had trained as a minstrel and called his friars "*ioculatores Domini.*" The Franciscan tradition of writing Christmas carols for the common people recognized the power of cheerful popular music.

In Arras, a French-speaking city in Flanders, the jongleurs formed a confraternity to guard a special **relic** of the Virgin Mary. They said that Mary had appeared to two jongleurs and had given them a holy candle, the Sainte-Chandelle that could heal ergotism, a disease called Saint Anthony's fire in the Middle Ages. Ergotism is caused by a deadly fungus that grows on rye in wet weather, but they did not know this; to them, it was a mysterious affliction. The jongleurs called themselves the Carité de Notre Dame des Ardents, and they held three-day festivals like guilds and parishes to celebrate their saint's day. They put on an annual play to reenact the appearance of Mary to two jongleurs. In this town, although jongleurs everywhere still had reputations of loose morals, the jongleurs became a leading force in religion and even in some aspects of government. Every outbreak of ergotism pushed the Carité and its holy candle into prominence again.

Troubadours

The poetry of the troubadours grew in the distinctively different culture of southern France—the regions of Aquitaine and Provence. Their language, known as Occitan or Provençal, was a halfway point between French and Spanish. Among their cultural differences from the rest of Europe, women had always had more rights of inheritance and sometimes ruled as countesses or duchesses. This region had more contact with both **Muslim** and Christian Spain, and their poetry may have been influenced by Arabic poetry. Their nobles were knights in the full tradition of French chivalry, but they were not Norman or Frankish in descent and were less violent. In this culture, an alternative form of Christianity grew; it was based in the old Arian theology to which the Visigoths had first converted in Roman times. Known as Albigensian or Cathar doctrine, the religion was pacifist and vegetarian and gave **women** full rights while insisting on abstinence from sex.

During the 12th century, the poetry sung at the small courts of Provence, Toulouse, Aquitaine, and Poitou elevated women to a new, powerful status. The songs developed conventions that permitted them to express strong feelings and make sexual innuendos without explicitly targeting or shaming any particular women. Most songs were addressed to *midons,* "my lady," who might be the lord's wife or any other woman. The songs addressed her intimately and personally, as though she, listening, would know that the song was addressed to her, without her name being used. Some used plain language, but later troubadour poetry invented sophisticated conventions of allusion, euphemism, and metaphor.

Scholars know little about the troubadours and their musical customs, in spite of how widespread and influential they were. In 1209, the Pope proclaimed a Crusade against the heresy of the Albigensians (Cathars). There was a full war against the strongholds of Toulouse and Provence, led by England's Simon de Montfort. Many towns were burned and massacred, and a follow-up Inquisition led by Dominican monks questioned people about their beliefs. The kings of France used the opportunity of a weakened south to annex the territory. The culture of Occitania was destroyed, along with manuscript **records** of troubadours. Troubadours who survived the war fled to Spain and Italy. They helped spread their musical and poetical style, but, removed from its native culture, the original art form died out by around 1300.

Because of the Albigensian Crusade's destruction, scholars can only guess at how the troubadours composed and performed. Some written music and many poems still exist, along with some medieval-era short biographies of leading troubadours. There are some treatises that specify the rules of the poetic conventions, but none are about the music or its performance.

Nobody knows if the poets also composed their own music or how they sang the songs.

It seems likely that, in most cases, a nobleman wrote the poetry and worked with a trained musician to compose the music. It also seems likely that most of the music was performed by these trained musicians—the jongleurs. There were probably exceptions, and certainly there were jongleurs who also wrote poetry. But unlike in modern times, when a singer's lyricist is not considered the primary artist, the nobles who wrote the poetry were considered the true troubadours.

The first known troubadour was Duke William of Aquitaine, who died in 1126. He may have been imitating Arabic poetry, or he may have been exercising his own imagination. Beginning at his court, five more generations of Provençal troubadours spread out over the region. At least half were nobility, and as many as 15 were noble women. Other troubadours were trained jongleurs who wrote for their patrons and their ladies.

Bertran de Born and Arnaut Daniel were famous troubadours whose lives were typical of their time. Bertran de Born was a minor nobleman, the lord of Autafort (or, in French, Hautefort). He was a vassal of Eleanor, duchess of Aquitaine (granddaughter of the first troubadour) and queen of England, and her son Richard I of England. De Born's political fortunes went up and down as he sided against the king in a rebellion and then won back his favor (and his castle). He entered a Cistercian abbey in old age and died there around 1215. Arnaut Daniel, another prolific and famous troubadour, was probably a professional jongleur, and he seems to have been well educated. A *razo,* a troubadour's introductory legend, claims that Arnaut performed for Richard the Lionheart in a competition at his French castle.

Their songs were written down, though existing manuscripts do not date to the earliest times. Many songs were written long after they had been composed. Different versions of the same song can be found in different collections. The collections of the time were made for aristocrats and are hand lettered and painted. They gave the lyrics and melodies, but medieval methods for writing music did not include a good system for indicating rhythm, so modern musicians who want to sing these songs must guess at how they went.

Some troubadours wrote very sophisticated poetry in their songs. Arnaut Daniel's work was admired by Petrach, Dante, and, in modern times, Ezra Pound. He developed the form of the *trobar clus,* the poetry of allusion and symbol to cloak the direct meaning. Some of the forms of poetry he pioneered have survived into modern use, including the sestina (which uses the same six words to end lines in each stanza, but in a different order). Troubadours preferred complicated rhyme schemes, often repeating rhyming words and whole lines.

A lord and lady sit at ease in their hall and listen to a troubadour. The lady holds a lapdog and the hall interior appears refined and luxurious. The troubadour, as befits his higher standing among musicians, wears neat, fine clothing and good shoes. He plays a viol to accompany his song's poetic lyrics. This painting probably depicts the court of King Alfonso X of Castile, who cowrote a book of troubadour songs. (Gianni Dagli Orti/Corbis)

As the troubadour style spread north into French dialects, the word *troubadour* shifted to *trouvère.* The earliest identified trouvère is Chrétien de Troyes, who also wrote epic poems. King Richard I (the Lionheart) also wrote courtly trouvère songs. As suggested in the legend of Arnaut Daniel's royal performance, the trouvères had competitions with prizes in the 13th century in northern France. The composer could perform his song or ask someone else to sing for him.

By the 14th century, the style spread to Germany, where the composers and performers were known as minnesingers. The ideal of courtly love became a fixed part of Northern Europe's culture, and it continued to influence songs, poetry, and popular customs long past the close of the Middle Ages.

The classic troubadour song described an ideal of unfulfilled love. The poet has fallen in love with a noble lady whose beauty was perfect and ideal and whose mind was refined and wise. The poet is not able to tell the lady of his love, but it may be seen in sighs and tears. He suffers, and the truth of his love is in the depth of his sufferings. His rivals jealously criticize him to the lady, and he trusts in her noble judgment to disbelieve their lies. He hopes she will grant benevolence and mercy on his suffering and give her love to him.

In a culture of arranged marriages, these ideas were very new. The ideal of courtly love elevated emotion and denigrated marriage, which was often about property and family alliances. Although arranged marriages were often happy, they could also involve great disparity in age or temperament. Divorce was unknown, although some nobility successfully divorced by petitioning the Pope to dissolve the marriage on the grounds that their spouse was a cousin. (Eleanor of Aquitaine divorced the king of France this way and remarried the king of England.)

The noble ladies who talked about courtly love rejected love within a marriage because the relationship had been forced on them. It was not possible, they said, to love without free choice. Therefore the only valid love was love for someone other than one's spouse. Troubadour songs explicitly celebrated adulterous love, although many songs praised this love only as an ideal, rather than as a sexual relationship. The lady of the songs was usually a noble and powerful lady, and real adultery with her could be very dangerous. It is impossible to know how much the songs explored fantasies, rather than telling about actual Provençal social reality.

Troubadour music was very popular with ladies. It permitted them to discuss and express emotion that did not previously have a place in official culture. The poems of female troubadours tended to be more personal, less ideal, and more deeply emotional than the conventional male troubadour songs. They expressed hurt feelings, joy, longing, and doubt. After the troubadour songs opened up the world of emotional expression

in literature, European poetry never went back to the early medieval fare of epics. Postmedieval stories and songs were more likely to celebrate personal lives and feelings long after the troubadour style had faded.

See also: Animals, Fairs, Feasts, Music, Women.

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Monasteries

The Middle Ages could be defined as the "Age of the Monastery." The presence and influence of monasteries shaped Europe tremendously. The medieval idea of holiness consisted of withdrawing from the world and living a life of self-denial. The difficulty was that monasteries had to make compromises when they began to own property and administer daily living for many people. Monasteries often became more similar to the secular world in their daily life and wealth. The Middle Ages saw a repeated pattern of reform and corruption. A new movement would arise, calling men or **women** to the monastic life, and then over time it would become part of the establishment, only to find itself the target of the next reform movement's criticism.

Monks all took a vow of poverty, but their institutions received many donations of land and other goods. By the close of the Middle Ages, about half of England's land was owned by some portion of the **church,** often by monasteries. Abbots and priors received rent from peasants and town citizens, in addition to the income the monastery derived from selling extra produce like wine or wool. Although the individuals owned none of it, the

monks in well-established houses lived in luxury. The popular **Robin Hood** tales and other medieval stories poke fun at fat abbots and worldly priors. When the reputation of monasteries fell too low, a new reform movement would launch an order with a fresh dedication to poverty.

Monasteries operated outside the church hierarchy; monastic orders were under the direct oversight of the Pope, rather than the local bishop. The head of a monastery was an abbot, and his assistant was the prior. When a monastic order created "daughter houses," they were often called priories and were ruled only by a prior, rather than by another abbot. The priories remained under the oversight of the abbot at the original monastery. Each monastery had lower officials who oversaw supplies, the scriptorium, or some other aspect of monastic life. When a monk entered as a novice, he could move up through a regular chain of promotion to become a prior or an abbot.

Monastic Orders

The idea of monastic living came from the deserts of Egypt and Syria, where premedieval hermits lived ascetic lives. Benedict of Nursia, a sixth-century monk in Italy, wrote his guide for monastic living at Monte Cassino. The Rule of Saint Benedict became an absolute monastic law during Carolingian times, including the rigid application of diet and dress appropriate to the mild Italian climate. Further reforms made Benedictine monks recite such an elaborate liturgy every day that they no longer had time for the manual labor Saint Benedict had outlined.

The medieval monastic orders varied in how they solved the problems of rigorous asceticism versus good health and the need for self-supporting work versus the demands of the liturgy. Over time, the Benedictines became less ascetic and allowed more meat and other luxury **foods,** while the Carthusians followed the strictest interpretation of the rule. Carthusian monks lived in unheated cells even in cold climates, and they never ate meat at all. The Rule of Saint Augustine was even more relaxed; Augustinian canons ate a varied diet and enjoyed more comforts and freedom. The Cistercians, who were Benedictine monks under the reformed rules of the monastery at Citeaux, followed an austere diet but did not occupy themselves with prayers and singing all day. Cistercians focused on manual labor; their monasteries became centers of agricultural and industrial innovation.

Monastic orders generally solved the problem of balancing labor and prayer with two levels of monastic profession. Choir monks had their heads shaved in a tonsure, a circle of **hair** around a bald top. They wore the cowled robe of their order and went barefoot or in sandals. They did not work but either studied or sang the hours. Choir monks were educated; they could read and write Latin. In the strictest orders, like the Carthusians,

the choir monks lived in isolation so that they could pray and contemplate. The same monastery had a larger group of lay brothers; they did not wear tonsures or cowled robes but had taken monastic vows. The lay brothers could be illiterate, but they had to be good workers. Lay brothers plowed, milked the sheep and cows, butchered pigs and smoked bacon for sale to the community, or even smelted **iron** or fulled **cloth.** Monasteries with large lay communities usually had more acreage and were self-supporting. They grew most of their own food and kept up a cash product like wine, wool, or cheese.

Each order had begun with a movement for reform when the previously dominant order's compromises began to seem too worldly. The Benedictine monasteries were the original movement in Europe, and they spread through the Christian world until there were Benedictine monasteries in every country, even in newly Christian Sweden. The abbey at Cluny, France, was the model for the best practices of the Benedictines; their closest imitators were often called Cluniacs. Benedictine monks wore black robes and plain **shoes.**

The Augustinian Canons were created in order to bring non-monastic clergy into line with Benedictine rules. The Rule of Augustine was less ascetic and strict, since those who lived by it had not chosen to become full monks. Canons were supposed to be serving in the world, not cloistered in a monastery. Although their rule was not as strict as Benedict's, the imposition of a uniform rule on clergy who were not monks was a reform in itself.

The Cistercian Order began in 1098 when a group of Benedictine monks set out to make a more primitive, more rigid life. A charismatic young monk named Bernard, later Saint Bernard, joined them. The primitive, fanatical character of their monastery attracted many who felt the religious life ought to be stringent in its devotion. By 1152, there were over 300 monasteries modeled after Bernard's abbey at Clairvaux. They fully developed the distinction between choir monks and lay brothers, since such stringent devotion could only be practiced by a few. The choir monks wore undyed wool, so they were sometimes called White Monks, although their everyday robes were natural gray. They wore sandals, as Benedict had originally directed, rather than shoes.

The Carthusian monks began as a small monastery in the foothills of the Alps in 1109. They lived as hermits, praying and contemplating in individual cells with food passed through a window. The choir monks only saw each other for church services; the work was done by lay brothers. The only work the choir monks did was copying and mending books. Although Carthusians officially wore white robes, in the Middle Ages they were known for wearing coarse, dirty clothes and hair shirts. This strenuous life of devotion attracted some, and the Carthusian Order also grew,

though not as rapidly as the others. Their monasteries were called charterhouses in English.

Although the Benedictine Order had taken in women as nuns, the Cistercian monks resisted, considering women a sinful distraction. Some convents grew up individually, including the French Fontevrault, where Eleanor of Aquitaine died, or Sempringham in England, which became a model for other English convents. In the early 1200s, many well-to-do young women in France and Germany, and particularly in Flanders, were drawn to a life of poverty. They did not join existing convents, but they lived together, refusing to own anything. They were known as Beguines. In 1233, Pope Gregory IX took them under his direct protection.

The next wave of monastic reformers criticized the way other monks withdrew from the world, leaving the poor ignorant and helpless. The Mendicant Orders, the friars, began as wandering preachers, rather than as cloistered monks. Saint Francis of Assisi was the first; he was a wealthy young man who had a dream that compelled him to seek a religious life. He gave up his possessions and wandered, barefoot in a rough brown robe, preaching. By 1209, companions had joined him, dressing like him in natural brown or gray robes and sandals, and an order began. The Franciscan friars were the last official order commissioned by the Pope, who felt there were too many orders springing up. The rule of their order forbade them to own possessions, especially land, so they had to beg. By the time of Francis's death in 1226, Franciscans had carried his vision as far as Spain, Hungary, and England. But after his death, the order, now ruled from Paris, changed

In the foreground, Carthusian monks are fishing with lines and nets. Behind them, the monastery's chapel towers over the red roofs of the lesser buildings. Monasteries were often built in a square with a wall to contain the monks and keep out the world's distractions. In an age of great uncertainty, the monastic life offered more peace and security. (Ann Ronan Pictures/StockphotoPro)

its rule and permitted only educated men to join. In England, Franciscans were called Greyfriars.

Dominican friars began as an answer to the simple poverty of the Cathar preachers. Saint Dominic, a Spaniard, began to walk about the Cathar strongholds of southern France in 1206. His followers also spread throughout Europe; they adopted the Rule of Augustine, but with a lifestyle of wandering preaching. Like the Franciscan friars, as time passed, the Dominicans settled into priory houses and became establishment monks, often attached to **universities.** Their official robe style was white, with a black-cowled mantle, so that in England they were called Blackfriars. Thomas Aquinas, the most famous theologian of the Middle Ages, was a Dominican friar.

Carmelite friars were a small order of hermits on Mount Carmel, near Haifa, in Israel. When they were driven out by the **Muslims,** they spread across Europe, founding Carmelite houses. Between 1238 and 1300, they became urban friars, rather than hermits, scattered across Europe; the English called them Whitefriars. Another small order, the Augustinian friars, also began as hermits around 1223 and also became friars at universities. The life of a hermit seems to have been initially popular but hard to sustain over decades.

Life in the Cloister

The ideal of the monk was to withdraw from the world and use a simple communal life to master the temptations and passions of the flesh. The buildings in which the monks lived were designed to support this goal. They were self-contained towns that needed little from the outside world, but all buildings were connected. A typical monastic layout had two large communal areas, the chapel and the cloister, a square walk that opened onto a lawn. The word *cloister* came from Latin *claustrum,* "an enclosure." The cloister itself was an enclosure, but the word *cloister* also came to stand for the enclosed way of life and the entire monastic compound.

The chapel was the heart of the monastery. All the monks, both choir monks and lay brothers, had a rigorous schedule of Mass and prayers to attend. They had to wake up in the night and sing Matins; Benedictine monks and lay brothers went back to sleep until dawn, but Carthusian choir monks stayed awake until the next service. Choir monks spent most of their days and nights going into the chapel to sing the hours, while lay brothers had a less demanding schedule but still attended two or three times a day. In the Benedictine ideal, the monks were to offer up continual prayer for the secular world that was busy doing other things. The strictest Cistercians sang or recited the entire Psalms (150 songs) every day.

The cloister, the square walkway that led to other buildings, enclosed a grass lawn, the garth. Monks were supposed to contemplate nature and

appreciate beauty, so the cloister lawns were carefully tended. Most had green grass and some trees and bushes. Monastic cloisters were especially fond of rose bushes. The monks were permitted to walk and sit in the open area when they were not at work.

The ideal of the monastic life was to work and live in silence. Monks were not permitted conversation in some parts of the compound, while in others it was only discouraged. In the refectory (the dining hall), conversation was forbidden. Monks developed hand signals for asking to have food brought by the lay brothers who served. They listened to the Bible being read while they ate and then left in silence. Elderly monks were permitted to talk in the infirmary, but they were discouraged from telling amusing stories.

There was always a lavatory room or stand next to the refectory. The monks had to wash their hands before eating, partly as a symbolic gesture. Monasteries were generally cleaner places than many other medieval communities. They had laundry facilities and planned for weekly baths. They were not only cleaner, but they were also more interested in health care. As a preventative measure, monks routinely had blood let. Several times a year, on a schedule, they went into the infirmary or lavatory and a barber or another monk cut a vein to drain their blood into a basin. Although this seems barbaric to modern eyes, it was considered excellent health care in its time. Monks who were weak from bloodletting could spend a night in the infirmary.

Depending on the plan of the order, monks slept in a communal dormitory or had individual cells. In either case, their bed furniture was restricted to a bed, a shelf, and a hook. They were expected to keep a certain few tools about them: a needle to mend their clothes and a knife to cut food or mend pens. Their clothes had to be embroidered with their names, since robes were laundered together, but they were expected to launder some small articles themselves (they could hang them to dry in the cloister). Although they were required to go barefoot on some occasions, they owned shoes and boots, and the order usually issued them a pair of new boots every year, which they greased to keep waterproof. They also kept combs, razors, soap, and towels. Monks in private cells sometimes had running **water** with a washing stand. There were few other possessions monks were allowed to have. However, establishments that were more lax turned a blind eye to some monks and nuns who kept pets. Convents seem to have been frequently filled with lap dogs and tame birds. Some visiting abbots had to impose rules against bringing **animals** into chapel.

Latrines were located near the dormitory; they were called the reredorter. They were planned for large-scale use; the monks did not have private toilets but used a room full of stalls with pit toilets. For the Middle Ages, the latrines were very up-to-date and sanitary. In many cases, water

carried the waste out of the grounds; either a cistern flushed the latrine pit or a stream continually flowed through it.

According to the Benedictine Rule, all but a few of the buildings in the cloister compound were unheated. The chapel, the dormitories, the workrooms, and the refectory had no provisions for fire at all. The kitchen, of course, had its cooking fires. The infirmary was heated, and one other building was heated on purpose. It was called the calefactory, the warming house.

The chapter house was another communal building, and it was used for all meetings. Meetings began by reading out loud a chapter from the order's rule, which gave the room its name. The chapter house could be used for other meetings and even for conversation. The chapter house had a parlor for receiving outside visitors or indulging in conversations, and monks often received their daily work assignments and **tools** in the parlor. The monastic **library** was also connected to the chapter house. Each year, at the beginning of Lent, every monk received a **book** from the library that would be his to keep for a year, to read and meditate on. Monks read books like Augustine's *Confessions,* collections of letters by early church fathers, commentaries on the Bible, lives of the **saints,** and sermons by contemporary abbots and bishops.

Monks had visits from family several times a year. There were guesthouses in these outer zones, near the gate, so family members could stay

In the illumination within a large letter *O,* an abbot leads his monastic community in prayer. The tonsured choir monks sit on one side, but on the other side, novices or guests with full heads of hair appear to be included. One monk stands ready to read a Bible passage in Latin. (The British Library/ StockphotoPro)

a few nights after their journey. **Pilgrims,** too, stayed at monastic guesthouses. Monasteries on main **roads** found their resources taxed by too many guests, and they had to restrict their hospitality. Less stringent monasteries sometimes rented space to doctors and shops for pilgrims. Some outside tradesmen came and went, too; professional barbers and tailors made visits to monasteries on a regular schedule.

The cloister compound contained many practical work and farm buildings. Even in a monastery without a large staff of lay brothers, the monks had to do some manual work to keep their community fed and clothed. Most monasteries kept **bees** so they could make their own candles, and many had fishponds. Large monasteries that did full-scale farming had the complete set of barns, butchering sheds, smoking sheds, dairies, and poultry yards. Some had **mills,** and Cistercian lay brothers could even run iron foundries or weaving and fulling sheds.

Men and women who were joining the monastery or convent were novices. They lived apart from the rest of the monks, and they were under special care. Their lives were usually not as rigorous; they were permitted more food and **clothing.** Each person had to live for a year as a novice to be sure the life of the cloister was really his or her permanent choice. When the time came to make a full profession as a monk, there was a reception ceremony with the whole community present. The newly professing monk made a will giving away all his possessions, and his head was shaved in a tonsure. During a Mass, he took the vows of poverty, chastity, and obedience. In some orders, the new monk spent three days in seclusion before joining the community.

The youngest residents of a monastery were the oblates. Until the Fourth Lateran Council of 1215 outlawed the practice, parents could give a young child to a monastery as a sacrifice to God. The child was usually around the age of beginning school or work training—between 7 and 10. Oblates were raised and taught at the monastery, and when they were of age, they took full vows. Some of the most famous medieval saints were oblates given to the cloister when they were very young; the monastery was the only life they knew.

Convents often found themselves caring for elderly ladies who either joined as nuns in their last years or just came to stay at the convent as guests. Monasteries, too, ended up providing nursing care for more than just their own aging monks. They kept infirmaries, but individuals also could rent a room or come to stay at the guest quarters. Monasteries also became an early sort of boarding **school;** they took in younger children of both poor and wealthy families and educated them. Many of these children took vows, renewed them when they were older, and lived out their lives in the monastery or convent. Not all were oblates; some were only there for temporary education.

Both monasteries and convents dealt with their share of community problems. There were conflicts and fights, and even some cases of violent mental illness that caused a brother to be locked up. The requirement of chastity caused continual problems for brothers and sisters who fell into temptation. Nuns were kept under great restraint and isolation; even when a convent was built next to a monastery and was under its protection, the sisters were never allowed into the monastery for any reason. Monks were supposed to keep themselves underfed and engage in cold baths to suppress sexual stimulation; they were also to avoid watching animals mate. Hired **servants** who had wives were supposed to live outside the precincts so that even their wives could not come near the brothers. Monks who oversaw novices were supposed to be careful neither to leave them alone nor to be alone with them without a third person as witness. Even with all these rules and safeguards, there were always reports of nuns becoming pregnant and sub-priors having affairs with servants' wives.

One of the monastic vows was the vow of stability, a promise not to leave the cloister without permission. Monks and nuns who became unhappy did sometimes run away. Some orders did not accept them back; a runaway Carthusian monk was unfit to be a Carthusian. Other orders accepted them back if they showed remorse. The rigors of monastic life—waking up at night for Matins, avoiding speech, always obeying the prior, seeing women and children so seldom, eating the bare minimum—were not easy to keep up over a lifetime. But compared to the rigors of secular medieval life, the monastic life was not as difficult as it appears to modern eyes. Many people never had enough to eat and did repetitive, dull work. The monastery offered friendship, health care, and security for the present life with the sure promise of heaven in the next life.

See also: Books, Church, Hospitals, Latrines and Garbage, Music, Water.

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Monsters

Medieval readers appear to have been highly naive and credible in their willingness to believe in both monsters and monstrous humans in other parts of the world. The standard Latin bestiary **books** included mythical animals with real **animals,** and there was no way for medieval Europeans to distinguish them. The Latin literature of the fantastic included a supposed letter Alexander the Great wrote to Aristotle to tell him about the amazing things he had seen in India and the *Liber Monstrorum,* a book about monsters. In Alexander's letter, real elephants and hippopotamuses were mixed in with fantastical poisonous snakes, men clothed in tiger skins, and talking trees.

The mythology of monsters combined the imaginative lore of the Greeks and Romans, which seemed unquestionably true to many in the Middle Ages, with the traditional monster lore of Northern Europe. Where the two overlapped, it seemed certain that the monsters truly existed. Dragons were known all over the world, as were elephants, and since few had seen elephants, the lack of actual dragon sightings meant nothing. Latin stories and Norse stories both talked about dragons, so they must be real.

Most monsters were considered evil. They were outside of God's household of faith, and some considered them to be the offspring of Cain, Adam's murderous son, or of Ham, Noah's mocking son. These men preserved the knowledge of sorcery, according to the legend, and the monsters were their offspring and were evil to the core. One notable exception was Saint Christopher, a dog-headed man who was martyred for his Christian faith. Some monsters were neutral, and some even symbolized tenets of the Christian faith. The phoenix symbolized resurrection.

Other monsters may not have been considered real even to medieval readers. Some—especially hybrids of known animals—were merely artistic creations. The field of **heraldry** created a wide range of creatures that may or may not have been considered real. Some were based on poorly reported distant animals, such as the transformation of the real jackal into the fictional "thos," a maned wolf with cloven hoofs. Some were purely artistic, such as winged stags. Most existed in between these clear categories, such that some people may have known they were fictitious, while others believed in their existence.

The dragon is the most outstanding case of a monster that nobody had ever seen but that everyone believed was real. The dragon, in every place and time, has been a large winged lizard, usually with the ability to breathe fire. There was no specific region assigned to dragons; they were thought of as migratory, seeking out treasure to hoard or victims to eat. Some dragons were drawn as small as a wolf, no more than predators of sheep, while others were drawn huge, with wide wings and long tails. Dragons were

generally considered to be evil and destructive, but they were also noble, perhaps due to their association with **gold** or perhaps because a Roman legion used a dragon as its emblem. **King Arthur** also was believed to have used a dragon as his emblem after his father saw a vision of a starry dragon.

In medieval dragon stories, **saints** and bishops were often able to command dragons. The most famous was Saint George, who first appeared in a 13th-century Latin book of saints' lives; the story originated in the Byzantine Empire. Saint George was a Roman Christian who came to a town in Libya where a dragon was terrorizing the town. Having fed the dragon all their sheep, they were feeding him their children, and that day the king's daughter had been sent to die. Saint George wounded the dragon, and he used the princess's girdle to put it on a leash. They led it back to the town, where the townsfolk all became Christians in exchange for the dragon's public execution. There were other stories of dragons that flew into a region and terrorized everyone until a holy man commanded them to go away or submit to death.

There were two small but terrifying monster reptiles. The basilisk was eventually renamed the cockatrice. It was probably at first a true report of a large crowned lizard in Asia, but, in time, medieval artists and writers gave it a rooster's head. It was said to be exceptionally poisonous; it could kill not only with its bite, but also with its touch, the sound of its voice, its smell, and a glance of its eyes. Medieval bestiaries recommended reflecting its look back with a mirror so it would kill itself. It was also good to keep a weasel to fight with it or a rooster to frighten it by crowing. The

Medieval artists were never quite sure what some mythical beasts looked like. The dragon shown this French commentary on the apocalypse (the end of the world) does not have wings or legs. It appears to be more like a giant snake than like a lizard. The four-footed beast behind it is called the behemoth, an animal mentioned in the book of Job, but without any real description beyond its great size and strength. A world that could contain these amazing beasts could easily have giant frogs or any other kind of monster an artist could imagine. (Paul Lacroix, *Science and Literature in the Middle Ages*, 1878)

salamander, which we know today as a small, harmless lizard, was considered a large, poisonous lizard that lived inside volcanoes.

Any number of reptilian monsters were thought to live in the sea. The Norwegian sea monster was called the kraken; they believed it was large enough to be mistaken for an island. Reports circulated that other monsters had washed up on beaches or had been sighted in lakes. Sailors believed sea monsters lived in the distant oceans. Other sea monsters were less dangerous and had specific names. They were animals, but in fish form. The marine lion was, literally, a **fish** thought to be shaped like a lion. There was a marine sow, a sea dog, and even a monk fish, a fish with a monk's head and tonsure. The ocean was a mysterious, large place, and it was full of strange things; anything could be out there.

The phoenix was a large bird monster borrowed from classical mythology. It looked like an eagle, but it was purple, the most royal color. Classical mythology reported that the bird lived on a nest of spices (surely the most expensive kind of bed). Every 500 years, it set its bed on fire, died in the fire, and was reborn as a small maggot that grew into a new phoenix. Bestiaries explained that God created the phoenix as a symbol of the resurrection of Jesus.

Some monsters were hybrids of known creatures. Medieval books told about mermaids and mermen who were fish on the lower half and human-like on top. They were considered dangerous and deceptive, and humans were told to avoid them, although they were beautiful to see and hear. Mermaids were popular devices on shields. There was also the centaur, brought from Greek stories. It had a human head and arms and the body of a horse or bull. The satyr, believed to live in Ethiopia, had the upper half of a man and the lower half of a goat. The most elaborate hybrid was the griffin. Bestiaries stated that griffins lived in Bactria, between the Himalayan Mountains and the plateau of Central Asia. The griffin had the lower body of a lion and an eagle's upper body and head, with blue or white wings and red eyes. Griffins were considered evil, but they were also interesting and noble and appeared on many heraldic crests.

The unicorn was the king of monsters and appeared in the most coats of arms, paintings, and tapestries. There was no doubt as to the unicorn's existence in reality. The Latin Bible used a word like *unicorn* to translate a Hebrew word now interpreted as "wild ox." The medieval Bible, then, appeared to refer to unicorns. This made them seem more real because the Bible talked of other animals of the Near East that were not seen in Europe. If lions were real, why not unicorns? Bible manuscripts sometimes had illustrations with unicorns, and sometimes unicorns were present in scenes of Noah's ark. All travelers in India reported seeing unicorns, and if they did not, artists drew unicorns anyway, since everyone knew unicorns lived in India. When Marco Polo, traveling in Asia, saw a rhinoceros, he was certain

he had finally seen a unicorn. Rather than doubting the unicorn's existence, he reported that the artists had surely gotten it all wrong; this was no beautiful beast, but rather a boar-like creature that lived in mire.

Some early unicorn pictures show an animal the size of a goat, with cloven hoofs. Some gave him a low-slung body more like a lion's. Some pictures showed unicorns with spots like a leopard or a fawn, and others with a curved horn. By the late Middle Ages, artists had settled into depicting the unicorn as a white **horse**, the size of a small horse, with a goat's beard and the long, straight spiraled horn of a narwhal. Its tail often was still more like a dog's than a horse's, with a brushy plume.

Some medieval writers described the unicorn as the fiercest beast in the world. Pictures showed it attacking elephants, lions, and armed hunters. During the unicorn's mating season, it was the fiercest of all and could attack anyone with success. In hunting pictures, the unicorn gored dogs and horses. The lore of *Physiologus,* an early bestiary, assured Europe that a unicorn could only be captured by a trick. It could not resist the purity of a young girl, and it would be entranced and come to her. It would lay its head in her lap or allow her to pet it. Then, said *Physiologus,* she could lead the unicorn to the king. But in depictions of unicorns in books, **tapestry,** and **sculpture,** hunters usually kill the unicorn with spears while it is distracted by the girl.

The bestiaries also stated that the unicorn had the ability to purify poisoned water by dipping its horn. Pictures showed animals coming to drink at a stream and waiting until the unicorn has done its work. Sometimes, poisonous animals are shown running away. For this reason, there was a

Early unicorns were much less horse-like than the modern depiction of a unicorn. Artists knew that they had one horn, but apart from that, some unicorns looked more like goats, lions, or donkeys. The white horse of later unicorn mythology began to show up only at the end of the Middle Ages, usually on tapestries. (Richard Huber, *Treasury of Fantastic and Mythological Creatures*, 1981)

market in unicorn horns, which were most often narwhal horns but were sometimes carved from an elephant's tusk. They were used to purify food or drink that could have been poisoned.

The unicorn's meaning increased with pictures that interpreted it as symbolic of Christ or love. Christ was pierced on the cross as the unicorn was pierced by hunters. The analogy could not be extended any more than that, but another analogy with Christ presented itself: as the unicorn allowed itself to be tamed by a young woman, so Christ's divine nature allowed itself to become a baby in Mary's womb. In some 15th-century depictions, the unicorn could symbolize a man's love, which permits a young woman to tame it and slip a collar on it. When the unicorn is shown tamed, in a collar or within an enclosure, love is more likely the meaning than Christ. The unicorn could also symbolize the virtue of chastity, since it was tamed by young maidens and could purify **water.** In some illustrations, a chariot drawn by a unicorn suggests that the woman riding in the chariot is particularly chaste. In some pictures, a lion and a unicorn together symbolized a marriage: the union of the brave and the chaste.

See also: Animals, Books, Heraldry, Tapestry.

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Music

Music, for most of the Middle Ages, was either a village folk song or part of the grand liturgy of a cathedral. Officially, music belonged to the **church** and the **university.** Music theory was a part of any serious university education and had been since classical times. It was a branch of mathematics, since the ratios between sounds could be expressed as **numbers.** It was also theology. God was defined as the purest and highest beauty, the highest possible perfection. When music is pure and perfect, it depicts God's

perfection for man's ears. Medieval theorists favored harmonies with the most consonance, such as octaves or fifths. Pure unison singing sounded more perfect to them. Out of a religious and theoretical framework, choral and instrumental music moved to greater complexity and then out of the church.

Plainchant

The music of the Latin Mass began as a simple unison form known as plainchant. Some chants were sung with a lead singer, called a cantor, singing a line and the choir responding. Although the music as written shows no embellishment, it is possible that individual soloists provided their own grace notes and variations. There was no set rhythm or timing; these matters were up to individual singers. The choir and soloists sang the prayers and Bible passages required for the day and hour.

Because the Benedictine liturgy was prescriptive and unchanging, variety came in changing the music to which the words were set. A "Magnificat" had to use the same words, but it could alter the tune or arrangement; it could repeat a phrase with musical variations. With each century, the liturgical music became more elaborate, and it began to take over the service. Some liturgical music was composed for special occasions, such as Easter or the nativity. These pieces created musical **drama** out of the story, with different singers and the choir responding to each other to create a play. Sometimes it was acted, with choirboys or monks walking into the sanctuary as angels or shepherds.

The modern major scale was only one of the possibilities in medieval music. The modern pattern of whole steps and half steps had been developed mathematically, but a melody could be based on any of the eight modes. Each one was a different arrangement of the whole and half steps. The choir director knew, from his training, which mode was in use for a particular hymn. The need to train choirboys began the process toward standardization and a written form for music.

Guido d'Arezzo, an 11th-century Benedictine monk, is given traditional credit for standardizing the way the scale was named. He noticed that the mode we now call the scale formed the rising tones of a well-known hymn to Saint John. The first syllable of each phrase was the next note of the scale: "*Ut queant laxis / Resonare fibris / Mire gestorum / Famuli tuorum / Solve polluti / Labii reatum / Sancte Iohannes.*" Based on the rising phrases of this hymn, the tones of the scale were named: *ut, re, mi, fa, sol, la, si.* (*Si* was formed by the initials of Sanctus Iohannes.) Later, *do* substituted for *ut,* perhaps for ease of pronunciation. In English, the last note became *ti,* but on the European continent, it is still *si.*

Polyphony

By the 13th century, polyphony was the focus of professional musicians. Polyphony, the use of more than one tone at the same time, presented a number of challenges that required several centuries to work out experimentally. First, how could they use more than one tone without dissonance? Dissonance, which is acceptable in modern music, was not acceptable to medieval ears. With more tones and a more complicated movement of voices, the challenge became harder. Rules of harmony were developed, but they were always being pushed.

Another problem posed by polyphony was that performers had to know how long to sustain their notes in relation to each other. If the harmonies were to be sung with a strict one-to-one note movement, it was not difficult, but if one voice was to sing multiple notes while another sang fewer, then the rhythm and duration mattered greatly. Written music had not developed a good way of showing this.

Moving into the 13th century, musical treatises began to discuss harmonies for three and four voices. At first, harmonization was kept simple by restricting one of these new voices to a repeated note, purely as accompaniment, not as a competing tune. The development of the motet pushed harmony to the next level. As the form developed in medieval church music, it used three voices, with movement in at least two of them.

The new innovations were not welcomed by theorists, and polyphonic music began to seem a distraction to the Mass. The Cistercians and Dominicans forbade the use of polyphony in services around 1250. In 1324, Pope John XXII forbade motets and other complex polyphony, restricting liturgical music to an older, simpler technique.

Secular Music

For most of the Middle Ages, the secular music of **troubadours** and **minstrels** seems to have been melody alone, without harmony. Innovation occurred first in church music, where society's energies were focused. When a trend was no longer current in the church, it came more into secular use, so when the church banned complex polyphony, it came into secular music. Manuscripts from the late 13th century document motets—songs for two or three voices. The harmony techniques are clearly those of church music, but the songs are of love.

Secular music focused on forms for **dancing.** In France, there were the rondeau, the lai (or virelai), the ballade, and the chace. The types of songs were mostly determined by the poetic style of the lyrics, as they had begun with the troubadours of Provence. The chace was a canon, or what we call a round in English, in which the second voice sang the same melody as the first voice after waiting to come in. These songs had complex patterns of

repeated melodies and rhythms to accompany formal dances. They could be witty; some imitated birdcalls.

The earliest Italian songs were the madrigal (simpler in harmony than the Renaissance madrigal), the caccia, and the ballata. The caccia was a canon, or round, using two voices plus a tenor acting as a bass line. The ballata was similar to the French virelai and may have begun as a dance. The best-developed examples of ballata come from the end of the 14th century; they are for two and three voices and use patterns of refrain and stanza.

Musical Notation

The earliest musical staff had four lines and used both lines and spaces. Some later staffs had six lines. Notes were squares, and some systems used color to show duration. Other systems used color to indicate half tones and had no notation of how long to sustain a note. Because notes covered a range greater than four, five, or six lines could show, the meaning of a line or space sometimes shifted.

Medieval clef signs were not fixed, as the modern soprano and bass clefs are fixed. A set of marks around a line defined the line's meaning, and all spaces and lines were read relative to it as steps up or down. This definition might change in the middle of a line of music if the composer needed the range to be lower or higher. The gradual evolution of conventions for standard clefs led first to the system of C clefs that moved up and down, showing where C was, and then to the G and F clefs that are still in modern use.

The problem of duration—of how to note the rhythm and timing of a tone—was the most vexing. The **cathedral** of Notre Dame developed a system of rhythm patterns so that the singer could be shown by marks called ligatures which rhythm pattern was indicated (short-short-long or long-long, etc.). The next innovation was mensural notation, which tried to indicate the duration of a note, rather than its place in a rhythmic mode. This became more important when parts were written separately but needed to be sung together. For a time, there were competing systems that used rectangles, squares, and diamonds, with and without tails. Over the century of experimentation, some tried pointing tails up or down to indicate duration, and others tried hollow or filled-in notes or notes with dots.

Philippe de Vitry's 1330's treatise *Ars Nova* suggested a system of time signatures, permitting a composer to better define the value he wished the basic note to have. By the close of the medieval period, music notation had not yet been standardized. In manuscripts, methods for notation could differ within the group. Color, solid or hollow notes, tails, and flags could all show duration. Simple time signatures, written as a proportion, were in primitive use.

Musical Instruments

Few medieval instruments survived. There are some late medieval pipe organs and a few violins and harps; there are bone whistles used by the common folk. Most musical instruments are known only from **sculpture** and **painting,** particularly from illustrations in manuscripts. In psalters, King David is usually shown with some kind of harp or lyre, and his musicians reflect the fashions of the time in which the picture was drawn. Stained **glass** windows often showed angels playing the instruments of the time.

Some instruments came to Europe from the Middle East, returning with **Crusaders.** The names of these instruments sound Arabic: rebec, nakers, añafil, and shawm. Some poetry manuscripts compiled by one of the Christian kings of Spain have many illustrations of Arabic-origin instruments used in **Muslim** Spain. The instruments were changed and improved in Europe. Native flutes and harps were combined with the new instruments to create hybrid forms.

The main way instruments were classified during the Middle Ages and the Renaissance had to do with their volume. Loud instruments (*instruments hauts*) should be played together in outdoor settings such as processions, while softer, quieter instruments (*instruments bas*) could play gently indoors. Shawms and trumpets were always loud, while stringed instruments and flutes were always soft.

During the early Middle Ages, skill with musical instruments was confined to traveling minstrels. They played solo or in groups, both to accompany songs and for dance music. During the troubadour period—the 12th and 13th centuries—more amateurs learned to play. In the late Middle

The theme of King David playing his harp was a favorite of medieval artists. In some pictures, David's harp is more lute-like, and in others, it is a primitive lyre. Here, his harp resembles the Irish harp, with a fully developed frame and sounding board. The four musicians surrounding him represent the other main genres of musical instruments: viol, horn, bagpipe, and drum. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

Ages, amateurs played a larger role. Town watchmen were often musicians who could play a trumpet or some other loud instrument to sound alarms. By the late Middle Ages, town bands had formed, with the watchmen as leaders. They played loud instruments for festivals, and some formed **guilds.**

Standards for tuning instruments to universal pitches were unknown until the Renaissance. Every instrument was tuned by the player's ear. An organ in one church might have its pitches tuned very differently from another. Every minstrel's harp was tuned individually. Town bands were the beginning of group instrumental music, and they began to find ways to tune instruments together.

Keyboard

As early as the 10th century, Winchester Cathedral had a pipe organ built in. It had 400 pipes, and it required a team to work its bellows. The bellows blew air across the pipes, which were worked with slides. There were no stops to keep air from going to some sets of pipes. The music was always multitone and sonorous.

The first primitive keyboards were in place during the 12th century, but the keyboard needed to improve for the organ to be useful for more than sustained notes and chords. The most important improvement was to rediscover the use of springs to make the keys come back up after being pressed. Roman organs had used springs, but early medieval keyboards had not. In the 14th century, the organ was the primary church instrument. By the turn of the 15th century, the stop had been invented; by moving levers, the organist could block air from some ranks of pipes. The organist could now choose which pipes to play at the same time. The church organ had many rows of pipes and two keyboards. Its sound was mellow compared to later pipe organs. Every organ had a different tone—some were louder, some more nasal, others sweeter.

There was also a portable organ called the portative, which could be worked by one musician. It was not used in church. It is probably the forerunner of the accordion, but in medieval illustrations it looks like a small pipe organ. It could be set on a table or held on a lap. One hand worked the keyboard, while the other pumped a small bellows at the back.

During the 14th century, keyboard stringed instruments were invented. The clavichord came first, in the early part of the century. Its strings were hammered by small metal blades called tangents. The clavichord was quiet, and the player could use the keys to produce a vibrato sound on the strings. A similar instrument was perhaps even closer to the construction of the modern piano. It was called a dulce melos or a chekker, but the references to it are obscure.

The harpsichord was invented in the later 14th century, but it only became popular during the Renaissance period. Its strings were plucked by quills, producing the sound of a harp but controlled by a keyboard. The harpsichord was a large instrument from the start; it stood on legs and was shaped like a modern baby grand piano. The strings were covered by a top, but sound holes were cut it in. In one early drawing, they are filled with tracery roses like a lute's.

By the 15th century, the modern chromatic keyboard had been developed, with its distinctive pattern of white and black keys. Two octaves required 26 keys that included the half steps of sharps and flats. With spring-loaded keys and a real chromatic scale, the clavichord and harpsichord crossed into modern musical instruments.

Strings

Stringed instruments were used only for secular music, to accompany singing or dancing. The instruments that evolved into the modern guitar and violin are not easy for modern readers to differentiate. They varied in how many strings they had, even if the instruments appeared similar in shape or use. There must have been several systems for tuning the strings. Instruments with three or four strings probably tuned them to fourths or fifths, to the individual player's preference. When there were more strings, they were often drones and could be tuned to the tone the minstrel preferred. Stringed instruments could have a sounding box to magnify the volume and tone and fewer strings that were shortened by pressing fingers to a fingerboard. The same instrument was sometimes plucked or bowed, and, over time, its size and shape varied. Only in the postmedieval period did stringed instruments begin to be somewhat standardized.

In the early Middle Ages, some minstrels used a lyre called the rotta. An example of this instrument was found in the Sutton Hoo **ship** burial, although it was in fragments and had to be reconstructed. It was long and flat and had an oblong hole cut by its strings, leaving a portion of the sounding board or box for fingering. By the 10th century, bows had been invented, and sometimes the rotta was bowed. There are medieval illustrations showing this lyre played both ways. The rotta fell out of use during the 12th and 13th centuries but had a revival of popularity in the 15th century. These revived rotta lyres were bowed and became another stage in the development of the modern violin.

Another medieval harp was the triangle-shaped harp shown in an Irish coat of arms, and its form came from Ireland. Minstrels used these harps extensively. In pictures, they have eight strings and are tuned with a specialized wrench, often shown in the illustration. By the 13th century, the harp was larger than its earlier form, and, although it could still be held in

the lap, its frame had a larger sounding board built in. The pillar closest to the player's body grew thicker with each new design, and it also began to have brays, *L*-shaped pegs that held the strings while increasing the volume. By the 15th century, harps were based on a hollow sound box with sound holes. These late harps were strung with brass wire and produced a very sweet sound, like **bells.**

The psaltery was an instrument similar to a modern zither; its sound box was the length of the strings. It was also called the canon. In the 15th century, a hammered psaltery called the dulcimer came into use. The dulcimer's strings were strung double, and they were separated more so that hammers could strike individual strings more easily. Some had an individual bridge, and others had a higher, more arched bridge.

The rebec was shaped like a lute but had only two strings. It was plucked, rather than bowed. Its use was most during the 12th century, when it was a new instrument brought back with the Crusaders, but it had a revival in the 15th century. It was usually tuned in a higher range of notes, so it could be used for dance music.

A lady, probably a nun, plays the psaltery in this ink drawing. She holds the sounding box of the instrument close to her body and plucks the strings. The man is dressed as a friar; he plays a gittern, an early form of guitar. (The British Library/ StockphotoPro)

The 13th-century fiddle was large, and it had three, four, or five strings. Its hollow body was usually oval, though in some forms it was waisted like a modern violin. The body may have been carved from a single piece of wood. Its strings stretched across a bridge to tuning pegs that stuck into the back, rather than out at the sides like a modern violin.

It is not clear whether the fiddle's bridges were always flat, but they may not have been curved until the 14th century. Bows used with these fiddles were not straight like modern bows; they were semicircles, more like archery bows, and had long handles. A bow used with a flat bridge could not sound the middle strings individually; it could play the top and bottom strings and chords of all the strings. The invention of the curved bridge made musical possibilities for more than two strings and for bowing rather than plucking.

The fiddle is most often shown played vertically, like a cello, but it is also shown resting on the shoulder like a violin. It may have been played vertically more often in Spain and other southern countries and on the shoulder more often in the north. In the 15th century, the fiddle grew more like a modern cello, large and with tones in the bottom range. In Italy, a smaller fiddle had evolved—the violeta. It had four strings, a curved bridge, and a bow. It was played only on the shoulder, and it was smaller than the modern violin.

The organistrum, which developed into the Renaissance hurdy-gurdy, began as a large stringed instrument that required two players. Its melody strings and drone strings were played with a rosined wheel that produced a continuous sound. Melodies were not played by directing pressing fingers to the strings, but instead by means of a keyboard that controlled tangents, small wooden wedges, that pressed the strings. At first, one player worked a crank to turn the bow wheel and the other played the keys. It was first used as a church instrument until churches adopted the pneumatic organ.

The organistrum developed into a one-person instrument sometimes called the symphony. A crank worked the bow wheel, but the instrument had been restyled so that it was like a box, and the keys that worked the tangents faced away and down from the player. Around the 13th century, the organistrum was not used in church any more, and as the "symphony," it became an instrument of secular entertainment. Its Renaissance form, the hurdy-gurdy, looked more like a violin. It is still used as a folk instrument in some parts of Europe, with a crank to turn its bow wheel and keys to play the melodic strings.

The medieval guitar of the 12th and 13th centuries, called in Northern Europe a gittern, could also be called a citole or mandore. It was held and played like the modern guitar, but it had a wide range of variation. The modern guitar has a flat back, a flat bridge, and frets along the fingerboard. The medieval guitar or gittern could have a flat back or a rounded back and

either a curved or flat bridge. Frets on the fingerboard could have been made by tying gut around the neck at the correct intervals, and they were optional. The number of strings varied from five to six. Strings could be made of gut or metal. If they were metal, they were tied to a peg at the bottom, but if they were made of gut, they could be tied to the bridge itself.

The lute had a separate development; it was originally an Arabic instrument called *al-ud*. It had a rounded back, built of wooden ribs, and a flat front with sound holes. These sound holes were not simply holes; they were filled with wooden tracery shaped like roses. The strings were gut and were strung double, attached to a flat bridge. They were played singly, plucked with a quill.

Wind

Horns were first associated with war and the aristocracy. The earliest horns seem to have been made from animal horns; the **hunting** bugle's name came from the Latin *bucullus,* an ox. These early horns could be large; when carved from elephant tusks, they were called oliphaunts. Roland's famous horn in the "**Song of Roland**" was an oliphaunt. They played a single note, which could be varied in its harmonics by tightening the player's lips.

A musical adaptation of the horn had finger holes. These holes were cut into the horn so the length could be changed for different tones. The player could also put his hand into the open end to change the tone. There is still a Swedish folk instrument that is a cow's horn with finger holes.

Real trumpets first came from Asia, via the Middle East, and came back to Europe with returning Crusaders. The trumpet's name in Arabic was *al-nafir,* and in Spanish, *añafil.* They were made of brass, and they were straight and very long. The trumpet seems to have been made in pieces and fitted together; medieval pictures always show it with round joints along its considerable length. We know them best from pictures of heralds with their trumpeters; the trumpets were often hung with banners.

In the 15th century, very long trumpets were adapted to be less cumbersome. Metalworking advances had allowed instrument makers to create tubes that gradually widened in mathematically precise harmonic form, and then to bend these tubes without distortion of the sound. A long trumpet could be curved into an *S,* or it could be looped around itself. Some mid-15th-century trumpets had slides, in both straight and looped shapes, as the precursor of the trombone.

The shawm also came into Europe from Arabia during the Crusader period. There are pictures that appear to be primitive shawms in ancient pre-Roman Etruscan culture, but its use had died out in Europe. Its sound came from a vibrating reed, like a modern oboe's, but it was designed differently.

A modern oboe's reed is held between the player's lips, but a shawm's reed was not. The player rested his lips against a mouthpiece that held the reed, but the reed itself was held freely inside his mouth. Its sound was louder than a modern oboe's; it tended to squawk. The end of the wooden shawm was shaped like a ball. During the Middle Ages, the exact size and shape of this reed horn could vary. Its modern descendants include not only the oboe, but also the bassoon, the clarinet, and the bagpipe.

Bagpipes may have come from the Middle East as well. They come into the pictorial record during the 12th and 13th centuries, at a time when many other Arabic imports came to Europe after the Crusades. The player has a mouthpiece to keep a large leather bag filled with air, and one arm squeezes the air out through a pipe with finger holes. This way, the pipe music does not have to stop for the player to take a breath. Medieval illustrations show variations on these instruments, including small air bladders at the top of the instrument, near the player's mouth. The pipe used in a bagpipe seems to have been a type of shawm.

Early medieval musicians also used panpipes made of different-length reeds tied together. They are shown in psalter illustrations of King David. They also had simple flutes with finger holes that were played like recorders. By the 12th and 13th centuries, illustrations show musicians playing flutes in both the transverse position—horizontal like a modern flute—and vertical like a modern recorder. They did not have a lot of finger holes, usually about six. Panpipes were not as commonly played, but a variation on the recorder-like flute was to add a drone pipe so that the pipes appear double. Only one of the pipes was fingered. The true recorder had been developed by around 1400. Its mouthpiece was carved and it had a small bell at the end. There were finger holes to make an octave, including a thumbhole; the last hole, played by a pinky finger, was moved to the side, as it is on a modern recorder.

There was also a very simple flute with only three holes; it was designed to be held and played in one hand. There were two holes in the front and one for the thumb. With only these holes, the pipe was able to play a full octave. The other hand beat a drum, called a tabor, that was held by a strap. The music played in a flute and tabor ensemble was simple, but since one person could produce both tune and beat, it was a popular mode for folk dancing.

Percussion

The tabor, used in a pipe and tabor set, was a round, flat drum with a string of gut stretched across as a snare. It was held upright by a strap around the player's body, so the player's hand was free to keep time on it with a drumstick with a knob. The tabor's stretched leather drumheads

were double, on front and back. They were held tight by being laced together with cord around the rim of the drum's frame, like later military drums.

There was also a timbre, the forerunner of the tambourine. It had a round, open frame covered with a taut leather drumhead on one side. The frame held pairs of small cymbals. People also played pairs of the wide, shallow bells that, in modern times, are called cymbals, but in medieval times, were just bells. There are also images of people playing triangles.

The large kettledrums now called tympani (Latin for drums) also came to Europe after the Crusades. An early form was small enough to carry as a pair suspended from a belt. They were called nakers, *naqara* in Arabic. They were played with heavy drumsticks. Pictures suggest that these drums, too, often had a tight gut string that acted as a snare. They were a very common form of drum and are shown in many pictures.

Church services also used bell music. Bells were suspended on a frame and struck by a hammer. These are most often called cymbala in medieval writing. The bell sets used in churches were handbells hung on a frame; it is possible there were ways to use a keyboard or levers to ring these bells, like a modern carillon. In the 15th century, some illustrations show a table full of bowls that acted as bells. They were played by small mallets.

There is no evidence of polyphonic instrumental music until very late in the Middle Ages. Some sheet music exists from the 14th century. Most instrumental music appears to have been played as a single melody on an instrument. By the 14th and 15th centuries, some instrument makers had created larger instruments that played in harmony with smaller ones of the same type. Instrumental music was imitating the complex vocal harmonies of the cathedral choir. A 15th-century painting shows three musicians playing recorder, and one recorder is smaller than the other two. It may have been pitched one-fifth higher so that it would be a natural descant harmony to the others. Smaller and larger shawms, trumpets, and violins also came into use. As instrumental polyphony increased, musical instruments that could be adapted to playing more than one note at the same time were honed to higher quality. Keyboard technology for organs and harpsichords improved.

See also: Cathedrals, Dance, Minstrels and Troubadours.

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Muslims

Muslims were a powerful cultural force during the Middle Ages, the height of their Caliphate. Their writings were in all the **universities,** and their traders could be found at the largest **fairs.** The exports of the Muslim countries were medieval Europe's finest luxury goods.

Origins of Islam

Mohammed, an Arabian merchant in Mecca, reported having visions in 610. In these visions, the angel Jibril (Gabriel) commanded Mohammed to learn, recite, and believe new revelations about the nature of a monotheistic God called Allah. Mohammed previously worshiped the local pagan deities of Mecca, whose central place of worship was the Kaabah. He told his visions to his scribe, who wrote them on various materials that came to hand; these revelations and sayings were not collected until after Mohammed's death. The first believers were Mohammed's first wife, Khadija, and his scribe, and then his wife's relatives and friends.

Because Mohammed's anti-idolatry message disrupted the idol commerce of Mecca, the tribal leaders drove them out in 622. The city of Medina was looking for an outside arbiter for their tribal quarrels and invited Mohammed to be their judge. The Arab and **Jewish** tribes were at first welcoming and tolerant of the small core of Muslims, and Mohammed's early teachings reflected a pro-Jewish trend, such as forbidding the eating of pork. The Arab leaders of Medina all converted to Islam, but the Jewish tribes did not change their beliefs. Mohammed turned against the Jews, who were massacred and exiled. He continued to war against Mecca until he conquered it and rode into the city in full possession of its authority. Islam took over the cubical Kaabah as its central place of worship.

Mohammed died in 632 in Medina. He had been both spiritual leader and civil governor of his Muslim polity, and there was no appointed successor. His fathers-in-law and sons-in-law succeeded him, but then the Muslims became disunified. Infighting between factions characterized the Muslim empire for the rest of the Middle Ages. Shi'ites would only follow those who could claim descent from Mohammed's family, while the majority Sunnis were willing to follow any strong caliph.

During the same time, the Byzantine Empire and the Persian Empire had been frequently at war between 571 and 630. Both empires had lost many soldiers, destroyed much property, and drained their savings. The boundary zone was just north of Arabia. It included modern-day Egypt, Israel, Syria, Jordan, Lebanon, Turkey, and Iraq. The city of Jerusalem was particularly damaged by conquest and reconquest. With Jerusalem, the ancient cities of Damascus, Alexandria, Caesarea, Antioch, and Nineveh were ruined. Rural areas of Armenia, Asia Minor (Turkey), and Mesopotamia were depopulated and could barely feed themselves. The armies that defended these territories were mercenaries who were accustomed to guarding city walls.

Under the first caliphs after Mohammed's death, the Arab tribes and their allies set out to conquer their known world. They met little resistance. Relatively small, untrained armies of Arabs on camels and **horses** were able to conquer enormous swathes of territory and overcome armies that would once have rolled over them. They occupied Damascus in 636, and Ctesiphon, Persia's capital, in 637. In 638, they took Jerusalem, and then Caesarea and Alexandria in 640 and 641.

After conquest, conversions were only forced on pagans who worshiped idols. Jews and Christians were termed "People of the Book" because, like Muslims, they looked to a written revelation for moral and theological guidance, rather than to an idol. They were not forced to convert, although they lived under restrictions and blatantly discriminatory laws. Muslim rulers followed a principle of taxing non-Muslims with a special tax called a *jizya*. In fact, the tax income of the empire relied on non-Muslims not converting. As more of the conquered peoples became Muslims, tax income dropped, which pushed the armies of Islam to try for more conquest. Non-Muslims faced legal discrimination in addition to a special tax. Those who did not recognize Mohammed as Allah's only prophet were, in the eyes of Islamic law, already not able to tell the truth. Therefore, non-Muslims were not permitted to testify in court against a Muslim.

Muslim Europe

Early medieval Spain was ruled by the Visigoths, a Germanic tribe that had invaded the Roman province of Hispania in the seventh century. The Umayyad general Tariq ibn Ziyad, a North African Berber, rapidly

conquered most of Visigoth Spain in 711. The Visigoth nobles pulled back into small kingdoms along the Pyrenees mountains and preserved Christian Spain until their Reconquest drive began in the 11th century. The Visigoths had been extremely repressive against Jews, so Spain's Jews welcomed and helped the Muslim invasion. They became full collaborators, helping govern the cities for the Arab conquerors.

Muslim armies pushed north. They captured the Spanish coastline and the southern coast of modern France, which was then the independent duchy of Aquitaine. They held the cities of Barcelona, Narbonne, and Marseille. The northern kingdom of the Franks was ruled in name by ineffective Merovingian kings and ruled in reality by their stewards, the majordomos. In 732, the majordomo Charles, later nicknamed "Martel"—the hammer—met Muslim troops at the northern border of Aquitaine, near Tours. Tours was only 150 miles from Paris, and it was the farthest north the Muslims went into Europe. Charles Martel defeated a much larger army very decisively. His successor, Pepin, began to push the Arabs out of Provence and Aquitaine.

Most of southern and central Spain, now known as al-Andalus, or Andalusia, remained Muslim for most of the Middle Ages. Further political infighting in the Middle East moved Andalusia into greater prominence. In 750, the Umayyads of Damascus were all killed by the rival Abbasids, who claimed descent from Mohammed's uncle Abbas. This violent change of dynasty drove the only surviving Umayyad prince, Abd al-Rahman, into exile. He traveled far from Damascus and ended up in Andalusia. Abd al-Rahman seized control of Cordoba and began expanding and unifying the Muslim kingdom. In 959, his descendant Abd al-Rahman III proclaimed himself the true caliph. The family had married many Christian princesses from the north, and Caliph Abd al-Rahman III had blue eyes.

Abd al-Rahman I and his successors built Cordoba into a great city with paved streets, a magnificent mosque made of red and white horseshoe arches, and a palace, Madinat al-Zahra. Cordoba at its peak may have been one of the largest **cities** in Europe. The palace was filled with **gardens,** high fountains, pools, fine buildings, statues, and a **zoo.** One of the legendary marvels of the palace was a pool of quicksilver (mercury) that made the room dance and spin with reflected beams of sunlight. The al-Rahman rulers imported palm trees and other native plants from the Middle East and spread Syrian agricultural methods through Spain. Both Jews and Christians served as advisers and viziers to the Cordoban caliphs.

North African Berber troops of a more fundamentalist Islamic faction destroyed the palace in 1009 and Cordoba in 1013. Many well-educated and skilled people moved from the ruined city to other cities such as Seville and Granada, and the Muslim Andalusian culture became decentralized. Granada and Seville built gardens and palaces similar to Cordoba's. The

The style of Arab warfare shocked Christian Europe, which had been accustomed to fighting on foot. The early Muslim armies used both horses and camels to move very swiftly. (Jupiterimages)

smaller Muslim kingdoms, called *taifas,* did not equal the wealth of the earlier capital of Cordoba, but the Alhambra palace in Granada became the most famous palace. It was built during the 14th century as Muslim power waned.

The island of Sicily was governed by the Muslim Caliphate from 965 to 1072, when it was captured by invading Normans. Its capital was Palermo, and it was ruled by a sultan. Under Muslim rule, Middle Eastern plants such as oranges, lemons, pistachio nuts, and **sugar** cane were planted. Middle Eastern irrigation methods modernized farms. Although Sicily was a Norman kingdom by 1130, Arabic continued to be spoken in many parts of

The dynasty founded by Abd al-Rahman built their capital, Cordoba, into one of the greatest cities in the world. The grandest building was the mosque, modeled after the medieval mosque in Damascus. Its striped horseshoe arches on onyx pillars were constructed partially using stones and pillars from ruined Roman buildings. The conquering Christian kings preserved the beautiful building, although they remodeled it into a cathedral. (Corel)

Sicily for a long time. The Norman rulers learned Arabic and adopted many Muslim customs. In nearby Malta, the native language of Maltese evolved from Arabic. The German emperor Frederick II was born to the queen of Sicily in 1194 and was educated there. He spoke and wrote fluent Arabic and corresponded with sultans and Arabic scholars. When he became king of Jerusalem in 1229, he reinstituted the Muslim call to prayer.

The Muslim culture of Spain permitted polygamy as a normal family institution; the caliphs and emirs had harems of Muslim and Christian slave girls, in addition to several wives. Muslim girls were kept secluded and rarely attended **school.** Many were raised in harems, and they usually married into polygamous families. They had few legal rights. However, there were some educated **women,** and several hundred women were paid **book** copyists at the height of Cordoba's wealth.

Muslim Influence on Europe

Trade and scholarship were Islam's biggest influences on medieval Europe. As the power of the Byzantine Empire lessened, Arab trading cities

were the source of exotic luxury goods. Spanish Andalusia, in particular, spread Middle Eastern technology. Arabic culture was viewed as more complex, refined and fashionable than Latin culture. Arabic science and poetry were admired and copied; both Jews and Christians in Arab regions spoke fluent Arabic and wrote poetry. Poetry and science both had longer traditions and higher social esteem in Muslim culture.

Damascus was a major center for raising silkworms and weaving silk, and the art came to Spain by the ninth century. Spanish silk brocade was a major export to Northern Europe. Baghdad, the new Abbasid capital of the Islamic Caliphate, became the most innovative center for **pottery.** Its tin-glazed white wares were exported until the method of glazing with tin caught on in Europe, first in Andalusia and in Italy and then in Northern Europe. White pottery with colored decorations became known as maiolica, named first for the Spanish island of Majorca, which served as a large trading port. Arab traders, often from Andalusia but sometimes from Sicily or the Middle East, attended the fairs of Champagne and other large fairs. They traded fine leather from Cordoba, kermes red dye, silk, and pistachio nuts for northern furs and wool.

Middle Eastern foods also came into Northern Europe through Andalusia. Oranges, dates, figs, and sugar came from Majorca and Barcelona. The word *candy* came from the Arabic word *qandi,* for crystallized sugar. There was a large sugar-processing plant on the island of Crete. Caramel and nougat were sweets invented in Andalusia and other Muslim places. Other Middle Eastern dishes came into Spain's customary diet and then into medieval recipe books.

Islamic scholarship was a great boost to European learning. Every region the Muslims conquered had its greatest works translated into Arabic, and Arabic became the language of the global library. Christian scholars studied Arabic texts in Cordoba and Barcelona, and they partnered with Arab scholars to translate many of these works into Latin. The medical texts of Avicenna and Averroes became standard works in medieval European medical schools. Arab-trained physicians, some of them Jews, were employed by European royalty. One, known as Petrus Alfonsi ("Piers Alphonse" in Chaucer), became a physician to William the Conqueror and wrote Latin works on Arabic concepts of astronomy.

The first translation of the Koran into Latin began around 1142, when Peter the Venerable, an abbot from Cluny, came to Toledo, then the capital of Christian Spain. He hired an Englishman who lived in Toledo to set aside his translation of al-Khwarismi's work on algebra and create a Latin Koran for him.

Arabic **numbers,** borrowed from Hindu mathematics treatises, came into use in medieval Europe very gradually and were established by 1500.

The **astrolabe** was introduced to European sailors and astronomers from Andalusia in the 11th century. It was made of brass, and it usually had Arabic letters and numbers on its face. Astrology and astronomy both came into Europe through Arabic, most often through the Spanish centers of learning.

See also: Astrolabe, Cloth, Food, Horses, Jews, Medicine, Numbers, Pottery.

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N

Navigation. *See* Compass and Navigation

Numbers

During Europe's Middle Ages, the reigning numeric system was the Roman one. Although Greece had used **alphabetic** letters for counting, the Romans pioneered a system of tally marks and letter symbols. I, II, and III were just tally marks, and V was a symbol for 5. By putting a tally mark before or after V, the counter could make 4 or 6. VII and VIII were 7 and 8. X was a symbol for 10, and tally marks before or after added and subtracted. IX was 9, while XII was 12. XV was 15, and IXX was one short of 20—that is, 19. With the addition of the symbols L for 50, C for 100, and M for 1,000, the Romans could designate any number with accuracy.

There was no convenient way to do arithmetic, since every number was a sum of its parts and symbols. The only way to calculate "C minus XXIV" was to work it in one's head or on an abacus and then write down the symbol for the answer. However, the Roman system was a good way to register numbers in a marketplace; it was a very concrete number system.

By 500, the scholars of India had developed a decimal number system in which place value determined the real value of the digit. They used only nine symbols that resemble modern numbers. Some scholars of the Jain sect pioneered early algebra equations and solutions methods. They called solving an equation "pulverizing" it, as though grinding it down to see what number was left.

One of the intellectual projects of the **Muslim** empire was to translate the classics of other languages into Arabic. This was the first ambitious effort to bring all human knowledge into one **library.** Arabic-speakers translated works from Chinese, Hindi, Egyptian, Babylonian, Latin, and Greek. Among the other scientific concepts Muslims brought into the Mediterranean world, the Indian number system made its entrance. A significant part of India was under Muslim rule, so it was an easy transfer of knowledge within the empire.

Al-Khwarizmi was probably a Persian living under Muslim rule in the eighth century. He wrote **books** on arithmetic and algebra that explained the methods developed in India. His name in Latin was written *Algorithmus,* which is where we got the word for a mathematical method. He explained many algorithms for using the new Indian number system to add, subtract, multiply, and divide. He showed how to find square roots and do operations with fractions. The word *algebra* comes from a Latin form of Al-Khwarizmi's Arabic word *al-Jabr,* which meant "transformations." In this work, the basics of balancing equations and dividing by coefficients are

explained. He also explained how to solve quadratic equations, but he did not make use of negative numbers.

Omar Khayyam, an 11th-century Persian, is best known for his poetry, but he was a professional astronomer and mathematician to the sultan. He wrote a book about algebra that expanded on Al-Khwarizmi's older work. He defined algebra—separate from arithmetic—as the use of equations to find unknown numbers with polynomials. He recognized the validity of irrational numbers and further developed the mathematics of conic sections.

The monastic scholar Gerbert of Aurillac, who later became Pope Sylvester II in 999, was educated in or near Barcelona. He learned the Indian-Arabic system of numbers and then became the tutor to the future German emperors Otto II and Otto III. As he rose in the hierarchy of the church, he wrote about and applied the mathematics and science he had learned in Spain. As bishop of Reims, he designed a hydraulic organ and wrote treatises on astronomy. He reintroduced the use of the abacus for calculations, but in the Arabic form, which was more sophisticated than the Roman. He explained the abacus with Arabic numerals, not Roman ones. He introduced a counting board with square counters to explain the method. The counting board became a standard part of commercial banking. As they began to use the new numerals, the counters got turned around, and some Indian-Arabic number symbols came into European use turned to the side or upside down from the way they were originally oriented.

Gerbert's counting board dealt only in the simplest arithmetic with whole numbers, but it was Europe's first introduction to place value. Gerbert called the first column of numbers 1 through 9 "digits," a comparison to the numbers we can count on our fingers. The word *digits,* of course, later came into general usage and has remained current. He was not as successful in explaining the larger place-value columns. They were not fingers; they were joints—"articuli"—but the idea of elbow or shoulder numbers did not resonate with Europeans. The concept of place value did not catch on except with a few scholars who continued to explore it.

One of the simplest concepts invented in India and developed in the Arab empire was the idea of zero. In a system dependent on place value, noting a zero is very important. The Arabic word for "nothing," *tsifr,* came into Latin as both *zephirum* and *cifra*. The forms *zero* and *cipher,* as well as French *chiffre,* meaning "a figure," all stem from these words. The English use of *cipher* to mean a code also recalls the mysterious nature of the new system. Gerbert of Aurillac may have understood the use of zero, but he did not attempt to explain it in 1000.

Europe's conversion to the Arabic system took several centuries. During the 12th century, there were increased efforts to translate Arabic mathematical treatises into Latin. Adelard of Bath translated an Arabic copy of

Euclid's Greek treatise on geometry and then an Arabic work on trigonometry. Plato of Tivoli translated more works and demonstrated how to solve a quadratic equation in Latin. Robert of Chester translated Al-Khwarizmi's algebra treatises. These works were not widely available but could be studied at some **universities.**

Leonardo of Pisa, usually known by the surname Fibonacci (son of Bonacci), grew up in the commercial and university city of Pisa. As a teenager, he joined his father in the city of Bugia, North Africa, to help with a commercial warehouse. He learned the Indian-Arabic system thoroughly for bookkeeping, and he may have studied with Arabic scholars in his travels around the Mediterranean. Back in Pisa around 1200, he wrote a book, *Liber Abaci,* that carefully explained the Arabic system and its advantages to a European audience. He introduced the words *multiplication, factor, numerator,* and *denominator.*

The German emperor Frederick II, a famous scholar himself, read the book and drew Fibonacci into an algebra competition. His court mathematician wrote three algebra problems and sent them to Fibonacci and two scholars of the Latin numeral system. In a public demonstration before Frederick in Pisa, Fibonacci solved all three problems, while the Latin numeral scholars could not. He went on to write *Practica Geometriae* and *Liber Quadratorum,* which explained trigonometry and quadratic equations in Latin with Arabic numerals.

Fibonacci's book, *Liber Abacus,* provided the first major introduction of Arabic numbers to medieval Europe. Although he was not at first a scholar, his private studies with Arabic mathematicians in North Africa and around the Mediterranean rim brought him to the attention of Emperor Frederick II. (iStockPhoto)

Liber Abaci is now most famous for presenting a medieval word problem. If a pair of rabbits produces one pair of offspring after one month, and a month later both pairs each have produced another pair, and a month later the rabbit pairs all have produced another pair, how many rabbits will there be after one year? Fibonacci demonstrated a table of Arabic numbers that neatly predicted the rabbit numbers after one year, two years, or any amount of time. The table's pattern of numbers is still taught as Fibonacci numbers, and the pattern also predicts patterns in nature, such as the rate at which the swirls of a snail's shell will enlarge as they travel outward.

Around 1230, an English scholar, John of Holywood, wrote a Latin book that explained the basics of Arabic arithmetic. *Algorismus Vulgaris* became a standard textbook at universities. Arabic numerals were still not in popular use, but thousands of students could learn the system.

Most Europeans had some objections to the new number system. The concept of zero was difficult, since Roman numerals were primarily for counting and there was no symbol for "nothing." It was not easy at first for them to see why 50 was 10 times larger than 5 when it only had "nothing" added to it. Italian bankers had been among the early acceptors of the system, since it simplified accounting. However, Arabic numerals were easier to falsify, so, in 1299, the city of Florence banned their use. Many other **cities** followed Florence's lead and refused to use the new numbers in commerce or government.

During the 14th century, European scholars produced not only translations but also original works on theoretical mathematics. Around 1325, Thomas Bradwardine wrote treatises in Latin, using Arabic mathematics, that established the beginning of mathematical physics. A French scholar, Johannes de Lineriis, invented the modern fraction, written as two numbers stacked vertically with a line between, around 1340. By the later 14th century, theoreticians in European universities were working on concepts of infinity, exponents, and coordinate geometry.

The 15th century saw popular acceptance of the new numbers. Theoretical scholarly achievements advanced more. A Persian, Al-Kashi, computed pi to 16 places around 1430. Even in the heart of Europe, the close of the Middle Ages saw major advances as mathematics was applied to architecture, art, and astronomy. By the end of the 15th century, some arithmetic textbooks were intended for use outside the universities. They demonstrated long division and multiplication, and some taught how to use the new numbers in accounting. By 1500, Arabic numbers were fully in use in commerce and in schools.

See also: Banks, Muslims, Universities.

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P

Painting

Art in the Middle Ages was part of religious expression. Where we view art itself as an end product, they viewed it only as a means to an end. For most of the period, the goal of art was spiritual devotion. They believed that love came from seeing and that people needed to see depictions of Jesus, Mary, and other **saints** in order to love them.

Art could also be purely decorative, but it focused mainly on making churches beautiful. **Churches** had as much art as they could find in their local culture, whether it was carved wood, carved **stone** or ivory, wall paintings, **gold** or **silver,** sculpted figures, or embroidered hangings. Decorative art reached a high level of sophistication by the end of the Middle Ages.

Byzantine art was primarily religious. Continuing a tradition from Christian Rome, art in Constantinople focused on mosaics and the stylized devotional paintings called icons. Icons were wood panel paintings that showed Jesus and the saints, typically in somber colors, and often utilized gold leaf. The gold leaf served as a shining halo around the head of a saint and sometimes as decoration on **clothing.** Faces and figures tended to be slender and tall, eyes were large and dark, and mouths were rarely smiling. Western Europe under the Franks borrowed its earliest ideas about art from visits to Constantinople. Charlemagne's chapel at Aachen had paintings, wood carvings, and gold decoration in direct imitation of what his ambassadors had seen in the East, and early medieval art copied from Charlemagne.

During the 11th, 12th, and 13th centuries—the period we call the Romanesque—the object of the painter or sculptor was to create an image that evoked emotion in the viewer. Often, the goal was religious devotion, but some art was made to beautify a room or building. Realistic detail was important, but only as it conveyed the meaning of the image accurately. Figures could be out of scale to each other as long as the viewer could tell what they were. Buildings could be shown unrealistically small for the people who were walking into them as long as the picture made the story clear. Colors had to be clear and bright, and certain colors were symbolic of purity or royalty. Gold, applied to the image to make it shine, was very important, and expensive materials made the picture better. There were artistic conventions for portraying clothing or body position, and, as long as these conventions told the viewer what was happening, it was acceptable if they did not look exactly like reality. Idea symbols, such as halos to show holiness, were part of the images.

Medieval artists showed no awareness of different clothing or building customs in different places or times. A medieval painting of Moses showed him in a contemporary robe and hat, and depictions of Bible towns like Jerusalem or Jericho were identical to medieval European walled **cities** and **castles.** Although they did not give their viewers any understanding of the

real world of the Bible, they created **records** for us of their contemporary buildings, clothing, tools, and food.

Even during the Romanesque period, some artists achieved good proportion or realistic detail. However, the value of art did not depend on artistic realism. The value of art was dependent on its content, its materials, and its success in using artistic convention to convey the message.

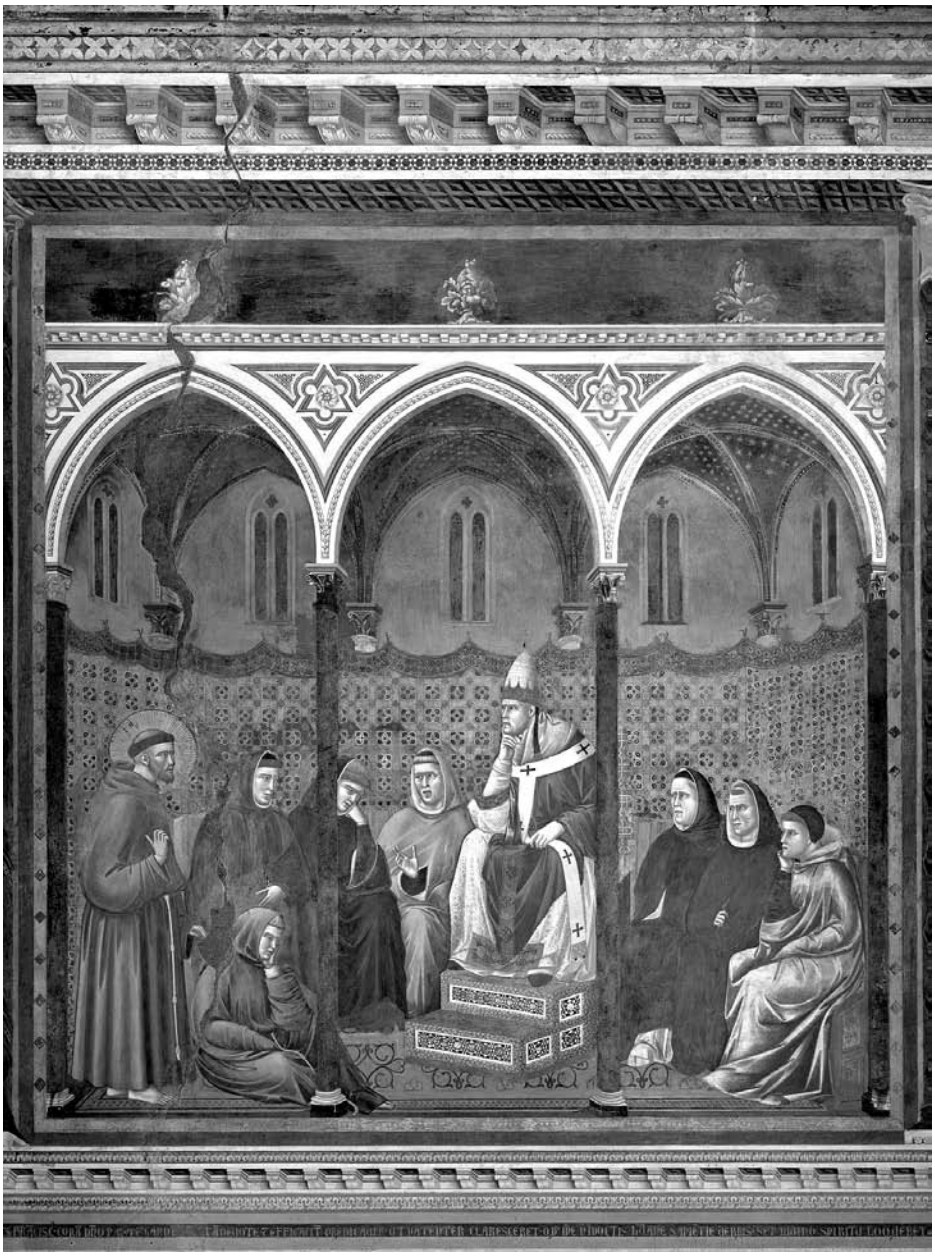
In the 13th century, the goal of artistic work began to shift. Painting technique improved after several centuries of stable apprenticeship training in the arts. Apprenticed painters began to practice figure drawing, and individual artists emerged as more talented and skilled than others. More materials were available: more painting tints, more kinds of stone or **pottery,** and more possibilities in stained **glass.** Great realistic detail was possible, and it was more often sought and achieved during the Gothic period.

Gothic stained glass art, wall paintings, **book** illustrations, and sculptures all improved dramatically. They still used bright colors and conventional symbolism, but they began to use more individual detail. A row of ladies could be posed in slightly differing natural poses, and their hairstyles would not be identical. Figures were not as symmetrical. Faces had more individual detail, and the drapery of robes, whether painted or carved, looked more like the pull of gravity on real fabric.

In 14th-century paintings, scenery was more in proportion to the figures; in a group of figures, some were layered behind the others to create a realistic sense of depth. The chief artist of the 14th century was the Florentine painter Giotto di Bondone, usually known as simply Giotto. He painted panels and frescoes; he documented the legendary life of Saint Francis of Assisi and painted many Bible scenes on the walls of the famous Arena Chapel in Padua. He painted the fresco murals of Florence's Peruzzi and Bardi chapels. When Giotto died in 1337, Florence gave him a state **funeral,** the first time any artist had been honored this way.

Giotto's ability with realism was strikingly better than the painters before him. He painted buildings with three dimensions and a vanishing point, instead of flat like the 13th-century painters. Squares turned to trapezoids, growing smaller with distance. Porches and eaves cast realistic shadows on the walls. Faces are depicted at many different angles, from full face to full profile, and proper perspective and shadow were always maintained. Contemporary viewers wrote that Giotto's figures were so close to life that they seemed to breathe and move. Gold leaf, halos, and religious symbols were still very important in the works of Giotto and his Gothic contemporaries.

After the Black Death **plague** of 1347–1350, art in Europe changed. Many artists and their patrons had died, and all craft training, including art, was disrupted. Society became preoccupied with death and, to some extent, disillusioned with the official church, which had not been able to keep up with the people's needs. Patrons began to commission portraits



Giotto, the most prominent painter of the Middle Ages, commemorated the life of Saint Francis in a series of wall frescoes in the church in Assisi, Italy. His use of natural poses and visual perspective stunned his contemporaries and influenced all painting after him. (Giraudon/The Bridgeman Art Library)

as secular remembrances of themselves, instead of only commissioning religious works. It was more important to the late Gothic painter to portray real life than to evoke devotion.

Technically, painting leaped far ahead in the 15th century. Perspective came fully into its own. Giotto's use of perspective had been correct but shallow; late Gothic painters created halls that receded and **roads** that wandered to a true vanishing point. Flanders was the center of a new realistic style of art, and artists like Jan van Eyck were leading innovators. Figures were turned asymmetrically, and they leaned, slept, stooped, crossed their arms or legs, looked bored or angry, or gazed at some unseen object. Rowers strained at oars, and Jesus on the cross slumped like a real dead body. Plants and flowers were not generic or symbolic; they were recognizable European plants.

In popular art, the figure of Death, as a skeleton or a Grim Reaper, became popular. Death was often dancing, pulling unwilling people into his **dance** with other skeletons and corpses. In the Dance of Death pictures, some people were rotting; ugliness was acceptable because death and life could be ugly. Nudity was more acceptable in art, perhaps because so many dying people had been seen or buried naked and the sight of the human body was more commonplace. Sometimes religious art depicted the resurrection of the dead, with the rising dead as nudes. Artists began to sign their works, from stained glass panels to frescos to portraits.

The Mechanics of Painting

Medieval paintings were not typically done on stretched canvas, as later became standard. Wall paintings were the standard decoration not only in churches, but also in many **castle** interiors. In Italy in the late Middle Ages, wall paintings were often frescoes: tints painted directly onto wet plaster to bond with the drying wall itself. Paintings were also created on wood panels. These could be hung on a wall, or they could be altarpieces that stood at the front of a church. Wood, not canvas, was the usual platform for paint.

Paintings were also book illustrations. If medieval artistic artifacts were counted as items, the paintings in books would far outnumber wall paintings and altarpieces. By far the greatest number of artists in the Middle Ages were worked in monasteries and cities, patiently creating detailed pictures of daily life to illustrate a book of hours or a psalter. Much of what we know about the period comes from observing the many scenes these artists painted: building, spinning, farming, cooking, caring for children, jousting, and scenes with **animals** of all kinds. Medieval book painters recorded daily life in such detail that we can trace the development of some **tools** and clothing styles, and we can see when **eyeglasses** first came into use.

Painters used different materials for walls or for books. Paint was a chemical bond between the tints and the material, and some kinds of paint and painting techniques worked only on **parchment** or only on plaster. Half the art of painting was knowing the secrets of mixing and using paint, while the other half was, of course, drawing images that were realistic and beautiful.

Paintbrushes were made from animal hair, usually a squirrel's. The hair was bound on the end of a stick, much the same as today's brushes. When a painter worked, he did not usually use a flat palette like a modern painter. Paints were often mixed in oyster shells or wooden dishes. Archeologists have discovered oyster shells with very old paint pigments still visible. Artists worked on upright easels if they were painting a book page or a wood panel. Many illustrations show artists working this way.

Paint is a binding agent mixed with pigments. To modern readers, who think of paint as made by chemical companies, the natural ingredients used by medieval painters can be startling or humorous. Toward the end of the Middle Ages, painters and apothecaries had developed some artificial tints, sometimes with fairly complicated chemical processes. Some binding agents were more suitable for books or for walls, and some pigments worked only for one or the other. Some paints could not be used next to others, since they would create a chemical reaction that changed the color. A large part of a painter's education was in managing the chemicals and knowing which ones to use and how.

Paint for books began with egg whites turned into glair, a liquid that mixes well with pigments and pours and brushes well. Egg whites do not mix well with anything until they have been beaten or strained. The finest method required the artist to hand whip the egg whites with a wooden whisk until they were very stiff and then allow them to turn back into liquid, which was called glair. When pigments were mixed into glair they sometimes formed bubbles, and the best way to stop this was to add a bit of earwax to the mix.

The other binding agent for book painting was gum arabic, the sap of an acacia tree. Other tree gums also were used. When the gummy substance was soaked in water, it provided a solution that would carry paint well. When parchment scraps were soaked and then boiled, they dissolved into the **water** and formed a jelly called size. Size was a good binding agent for some blue pigments. Other odd ingredients for book paints included spinach juice, apple vinegar, **sugar,** and stale beer.

The binding agent for wall or wooden panel painting was usually egg yolk. This was the main paint used in Italy, and it was called tempera paint. Egg yolk dried quickly and was glossy and long lasting. Its yellow color did not alter the paint's color much. Oil as a medium for tints came into use only in the late Middle Ages. Especially in northern regions like Germany, paint for murals was based on linseed oil.

Medieval paint pigments were bright and clear, not shadowed or nuanced as later Renaissance painters preferred. Most pigments needed to be crushed finely before being mixed into the binding agent. The painter first used a mortar and pestle, but the finest grinding required a small slab of marble with a block of marble rubbed across it. The crushed pigments were mixed into a thick paste with water and stored either wet or dry. The painter used a small amount of the pigment mixed into the medium (such as egg yolk or glair) to make the amount of paint he would need for the day's work.

The most common white pigment came from white **lead,** which was produced in a chemical reaction between lead, acidic fumes from vinegar, and carbon dioxide from fermenting tanning bark or dung. The process grew a white crust on the lead, which could be crushed into a stable, thick white pigment. It was also poisonous.

Black pigments were natural. They could be from **iron,** as in most black ink, or from soot rubbed off a lamp. Black pigments could also be made from the carbon charcoal of grape vines or peach pits. Other charcoals would do, but artists preferred these plant charcoals.

There are natural clays that make good paint pigments, as well as a few red clays. They are high in iron and are called ochres. They were the original prehistoric red paints of cave walls. Several red pigments were made from crushed insects, and another common red was extracted from the wood of the brazil tree. The most successful red tint, though, was both artificial and **poisonous.** Vermillion red was made from a chemical reaction between mercury and sulfur. Cinnabar is a red sulphide of mercury and occurs naturally in Spain. In Roman times, chemists learned how to extract mercury from cinnabar. Vermillion was the result of adding sulfur back to the mercury; it was artificial cinnabar.

The best blue pigment came from a mineral, azurite. It produced a paler blue paint if it was crushed more finely. When coarsely ground azurite was mixed with size to produce blue paint, it required several coats, but the finished dried product had a sparkling quality like the original mineral. An even better blue called ultramarine came from crushed lapis lazuli, a mineral found in Persia, but ultramarine paint was rarely used, and only for the most expensive items, where the goal was to show off conspicuous wealth.

Most blue tints came from plants. The best came from indigo, a plant imported from India, but Europe had a similar dye plant called woad. Both plants produced a blue dye as sap. Woad had also soaked up potassium, and if craftsmen burned woad roots, they could get very high-quality potassium ash to use for making lye. Woad also ruined the soil it grew in by drawing the potassium out, and medieval farmers did not have good methods for replacing it. Woad leaves and indigo leaves were processed similarly for their pigment. Dried and crushed, they were fermented in water until foam

collected on top; this was skimmed and dried to make the concentrated pigment. The water itself could be used to dye cloth. Another common plant called the turnsole had seeds that produced a strong juice. It could dye pieces of **cloth** red, purple, or blue, depending on what else was mixed with it, and the pieces of cloth served as storage for the pigment. The pieces of cloth were called clothlets, and they could quickly stain water or glair into an active, bright paint.

The advent of artificial dyes brought copper blue. Although **copper** is naturally green, with the addition of ammonia (easily obtained from urine), it turns blue. The color became chemically stable if lime was added, and this chemistry process produced a cheap, bright blue that became an all-purpose paint for walls, wood, and books.

Yellow could be made in many different ways. Some clays produced yellow ochres, particularly if they contained limonite. Yellow ochre paints were used mostly for wall murals. Bile from the livers of **fish** or turtles also produced yellow pigment. Saffron, the powdered stigma of the crocus flower, was an important **spice** in cooking as well as a yellow pigment. Unripe buckthorn berries gave yellow pigment, as did an herb called weld, which was often used in dyeing.

Some chemical processes also made yellow pigments. White lead, when roasted slowly, turned yellow and then orange. A kind of false-gold mineral called orpiment created a good yellow pigment, but it was not compatible with other pigments like verdigris and white lead. They could not be used where they would overlap or touch because the chemicals reacted and destroyed the colors. Manuscript painters used a chemical pigment known as mosaic gold; it was a tin sulphide that was difficult to make and involved tin, mercury, sulphur, and sal ammoniac.

Some clays produce a dull green pigment useful for scenery on large wall paintings. A mineral called malachite is often found with azurite, and, when it was crushed, it produced a green pigment that was used in the same way as azurite blue.

A chemical process created the most common green pigment. Copper oxide was made by exposing a sheet of copper to the acidic fumes of vinegar, and the chemical reaction created a green crust on the copper. This green pigment was called verdigris. Verdigris was not a stable chemical, and, unless the perfect binding agent was used, it would turn dark with time. Medieval painters were aware of this, but the green lasted reasonably well for several centuries, so they did not know how severe the darkening would eventually be. Verdigris green appears on many wall paintings, where it is now brown or black. In book illustration, it lasted better. It was usually dissolved in wine and made reasonably good paint.

Saffron yellow was often mixed with verdigris, but white lead paint was chemically incompatible with it. Several plants provided good greens that

were compatible for mixing with white lead. Sap green and iris green were made from the juice of the ripe buckthorn seed and the iris flower. The iris flower gives a purple juice when it is squeezed, but this juice turns green when alum is added. Some other flowers and leaves, such as nightshade, also made green pigment. Finally, blue pigments with saffron added made green.

Purple in Roman times came from the whelk, a shellfish that produces purple dye. Medieval purples probably did not come directly from shellfish because the whelk dyes were so expensive. They were made from a plant called turnsole or from a type of lichen. Or, simplest of all, they were blended from red and blue, as long as the chemicals in the red and blue were compatible.

Gold and **silver** were used directly in painting. Gold was powdered and mixed with a medium like glair, but gold does not grind to powder easily. It first has to be turned into an alloy, using another metal like copper or mercury, in order to overcome gold's natural property of holding together. Gold can be beaten into a very fine sheet or wire and will not become brittle, so it did not grind, either. Silver was easier to grind, and it could be mixed into the binding agent like another pigment. Painters sometimes tried to mix powdered silver with yellow saffron powder so it would look like gold.

While gold was difficult to crush for paint, it could be beaten into very thin sheets of gold, called gold leaf, and glued to parchment or wood. Gold leaf had to be burnished so that it would shine, and the most likely burnishing tool was a tooth mounted on a wooden handle. Sometimes colored paint was put onto the gold leaf so that the dry paint could be scraped away in places to allow the gold to shine through. This technique is called sgraffito.

When an artist prepared wood as a surface to paint, he began by sanding it carefully. In Germany and France, hardwoods like oak were available, and they required only a surface layer of chalk to be prepared for painting. In Italy, only softer woods were available, so the artist covered them with a layer of plaster called gesso. Gesso was made of chalk or gypsum mixed with glue. When it dried, it could be polished into a perfectly hard, smooth surface that took paint well. Areas requiring gold leaf first received a layer of red clay, and then the gold was painted onto the clay and burnished. Paint might go over the gold leaf for a sgraffito technique. This was especially used on wooden altarpieces because it allowed gold stars or golden rays to shine out from a dark surface.

For general work with wood panels and frames, artists used glue, rather than nails. One common artists' glue was made from cheese and lime. The cheese was soaked and crushed in water, and powered lime was mixed in. The glue was very strong and has lasted many centuries. Another kind of

glue was made from soaking and boiling animal skin and cartilage until they dissolved. Stockfish, too, could be made into fish glue this way.

If a wall was to be painted, it was first carefully plastered to make the surface very fine and smooth, rather than painting directly on stone or brick. Sometimes a coat of tar went first, to waterproof the wall. Wall painting in Northern Europe was generally done on a dry surface. It was nearly always indoors. Many walls of **castles** and chapels had murals showing scenes from the Bible, the lives of saints, or daily life. The scenes were large, often nearly life-size. **Hunting** in a **forest** was a common motif.

Medieval wall painters also decorated some portions of walls with drapery, as though the wall were curtained. After 1300, there was a fashion to cover walls with "diaper," an allover pattern of diamonds similar to modern wallpaper patterns. To keep the designs even, painters used stencils, often cut from thin sheets of lead.

Fresco painting developed in Italy during the 14th and 15th centuries and was used into the Renaissance. It was a cheap substitute for Byzantine-like **glass** tile mosaics and woven **tapestry** wall hangings. A fresco painter started at the top of a wall. He put a layer of fresh rough plaster on the wall and sketched the lines of what he was going to paint. Over this, he put a thin coat of fine plaster so that the lines still showed through. He only plastered as much as he could paint in one day before the plaster dried. Fresco painting depended on the weather, which had to be just right so that the plaster dried on time—not too quickly or too slowly.

Fresco painting is the best-known wall technique, but it was mostly used in Italy at the end of the Middle Ages. The artist tinted fresh plaster, working quickly and only applying as much plaster as he could paint before it dried. Fresco colors have proven very durable over the centuries, especially when the work was not exposed to the weather. Most other wall painting techniques have suffered chemical changes in their colors, but fresco tints may be as bright as when they were first applied. (Claudio Giovanni Colombo/iStockphoto)

The fresco artist painted with tints that bound directly with the gypsum in the plaster; they were not mixed with the binding agents used in other painting techniques, such as egg or gum arabic. Some tints, such as lapis lazuli blue, had to be put onto dry plaster. Fresco painting did not take details well, so early frescos were touched up with egg tempera paint. Some frescos had only the backgrounds put onto the wet plaster, while the rest was painted in tempera. Experiments with oil painting on plaster showed that it disintegrated over time, and traditional fresco was better. The tempera details held up better but were also prone to flaking off over the centuries.

See also: Books, Gold and Silver, Records, Sculpture.

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Parchment and Paper

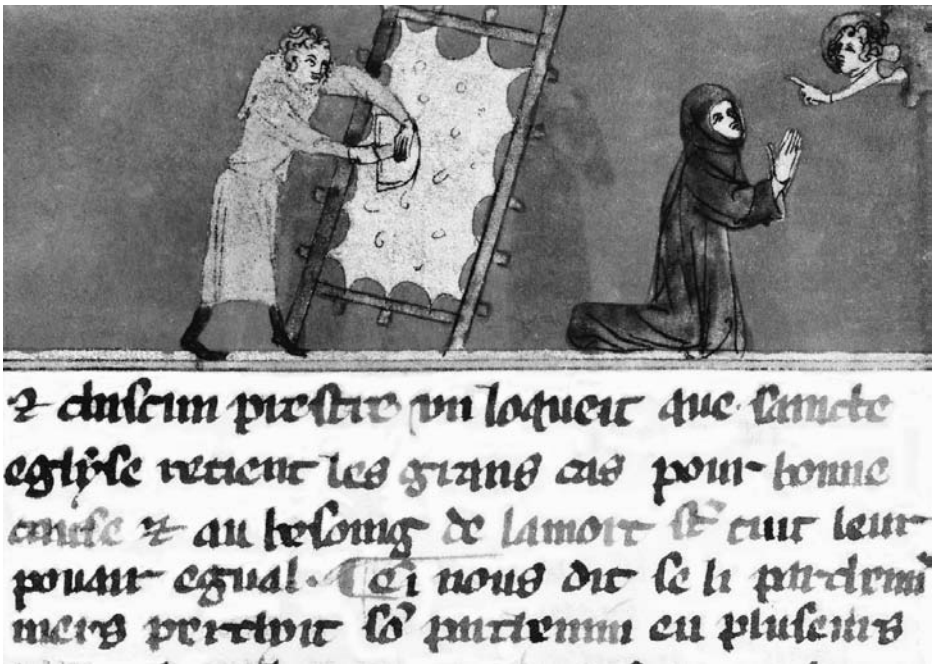
Parchment was the standard writing material for most of the Middle Ages. It was simply leather, treated specially to make it into a smooth, white surface. Paper was a new invention brought from Asia during the 13th century. Paper was made by mixing plant fibers with water and spreading the mixture over a screen or a mold. The fibers dried, resulting in a sheet of paper. The results were similar, but the technologies were very different and required radically different manufacturing processes.

Parchment could be made from the skins of goats, sheep, cows, or other **animals.** Vellum was a very fine, expensive parchment made from the skins of young animals (calves, lambs, or kids). Because of their larger size, cows provided the materials for larger sheets of vellum used for large **books** such

as large Bibles or choir books. Fatty animals provided poorer quality parchment. Apart from questions of size, different regions used primarily the animals they naturally raised. Parchment making kept pace with butchering, recycling some portion of the skins.

Fresh skins had to go straight to the parchment maker, where they were soaked in **water** so that blood and fat could be scraped off. Then the clean skins were soaked for a few days in a solution of lime (calcium oxide) and water. This loosened the hair so it could be rubbed off easily, and it drew out some of the fat in the skin. The wet skin was stretched on a large hoop. Workers used curved blades to scrap the hides smooth. They also rubbed them with substances to treat the surface: ashes and lime to draw out fat and alum to harden it. Additionally, the surface of the drying parchment was sanded smooth with a pumice stone. Where pumice was not available, some parchment makers baked ground **glass** into bread and used that to rub the skins.

When the skins were fully scraped, sanded, and dried, they could be removed from the hoops. They were cut to size, usually for books. Most parchment required a last treatment of chalk or pumice dust. For some purposes, it was painted with a thin coating of glue or with coats of white



Parchment took several days to prepare, from a fresh animal hide to smooth, white, polished vellum. It had to be stretched and scraped while wet. (Musee Conde, Chantilly, France/Giraudon/The Bridgeman Art Library)

paint. Parchment could also be dyed blue, purple, green, or other colors. Gold paint stood out well against dark colors.

The technology for making paper was developed in China. The use of paper moved westward to Europe by two routes: through North Africa and into Spain and through Central Asia along the Silk Road. Samarkand, which is located along the Silk Road, became a center of papermaking because of its good crops of flax.

The increased paper production of the late Middle Ages was dependent not only on gaining paper technology from China, but also on the availability of linen rags. Chinese paper had used mulberry tree bark, which was unavailable in Europe. Until technological and agricultural advances made linen towels, shirts, and sheets common, there were not enough materials to make paper in Europe. Worn-out linen could be bought and shredded for paper; the linen rags were first torn up, soaked, shredded, and beaten. Then the linen pulp was spread into a mold, pressed, and dried. Dry sheets were sanded with a stone and then dipped into sizing made of gelatin and alum.

The first water-powered paper mills were in **Muslim** Spain because the technology came from Baghdad during the 11th and 12th centuries. The first paper mill in Europe was established in 1270 in Fabriano, Italy, and the first watermarks were used in Italy in 1282. Water-powered paper **mill** technology reached Northern Europe during the remaining medieval centuries, arriving in England in the 15th century.

Europe's acceptance of paper was slow. Parchment was easily available, and there was little demand for paper because few people could read. Also, the **church** disapproved of paper because of its Muslim origin, and laws forbade the use of paper for public documents. In 1221, Emperor Frederick II declared that documents written on paper had no validity in law.

But as paper became less expensive than parchment, handmade books were easier to create and depended only on the number of scribes who could be employed. Commercial stationers contracted with scribes to make copies of books for **universities.** The availability of paper books was a step toward the invention of a mass-printing technology, and the role of paper changed dramatically with the invention of **printing.**

In the first step in manufacturing paper, the fibrous material was prepared in a vat using linen rags soaked in water that was kept warm and stirred with a pole. For higher-quality paper, silk rags were used, and the rags were cut by hand, rather than by machine. The paper mold was a wire screen in a wooden frame, topped with a second, removable screen that determined the size of the sheet of paper. This screen was called a deckle, from the German word for "cover."

The vatman dipped the mold vertically into to the fibrous liquid and then laid it horizontally. A worker shook the pulp on the screen, forward

and backward and then side to side, to mat the fibers together to make stronger paper. Then the deckle was removed.

After adequate draining, the mold was turned face down on a piece of wool felt. The mold was lifted off, the paper clung to the wool, another felt was laid on top, another sheet of pulp was added, and so on. The whole pile, which might be as tall as two feet high, was put into a screw press to squeeze out as much water as possible, lowering the height of the stack to about six inches. For finer paper, the sheets were pressed a second time. The felts were then reused for the next stack.

The paper then was dried over horsehair cords in groups of four or five sheets; grouping the sheets helped the paper dry fairly flat. Paper that was to be used for writing was dipped in a starchy liquid (a sizing made of animal- or vegetable-based glue) and again pressed and dried.

The forms used for drying left a pattern in the paper. The mill at Fabriano developed the watermark, a design that identified a specific mill. This watermark design was made of fine wires so the design was pressed into the finished paper. Sometimes the paper mill also used a heavier cord that would leave a slight indentation along the margin of the paper to show where the writing should stop.

See also: Books, Cloth, Pens and Ink, Printing.

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Pens and Ink

In a time when all **books** were handwritten, pens and ink were the signature tools of the scholar or student. Pens were handmade by each individual scholar, and, at times, ink must have been a homemade concoction as well.

Medieval pens were usually made from quills or reeds. Feather quills were the most common, but hollow stems of marsh reeds could be cut the same way. The outer wing feathers of a large bird such as a goose or swan have large, translucent tubes as center ribs. Scribes cut away the feather's soft part with a penknife and dried the quill. They carved the tip to have a single fine point and then split the point vertically. Dipped in an inkpot, the quill would hold and distribute a drop of ink. The split point would spread to make a wider line as the scribe pressed harder.

Perhaps because writing and illustration usually took place in the same monastic scriptorium, the act of writing is one of the most frequent themes of painted book illustrations. Medieval painters were not careful about relative size of objects, but they provide accurate detail about pens and inkpots, the writer's tools. Here, the quill pen has been stripped of the soft feathering, and the writer's left hand rests on the penknife to hold the page steady. (Bibliotheque Municipale, Valenciennes, France/Giraudon/The Bridgeman Art Library)

The penknife was an important secondary tool. It had a long wooden handle and a short, sharp blade. The scribe used it to sharpen his quill frequently, quickly carving in strokes toward himself. He also used it for scratching out mistakes, for holding the parchment or paper flat and steady, and as a hand rest. As the quill was in his right hand, the penknife was always in his left.

A small number of pens were made of brass. A brass pen was a stick, roughly round or hexagonal, with a point on the end. The long point had grooves that held a certain amount of ink after being dipped.

Inkwells in a scriptorium were often made from hollowed horn. Each horn fitted into a hole drilled in the slanted writing table. Portable inkpots were made of **pottery** or brass and had lids. Many medieval illustrations show scribes working with both kinds of inkwell; if the writer is shown sitting outdoors, his inkpot is always the portable, lidded kind.

The word *ink* is short for Latin *incaustic,* which means "burned in." Since burning is a chemical reaction with oxygen, other forms of oxidation were also called "caustic," and the black color was "burned" onto the page by means of drying in the air (a form of oxidation). Medieval ink was usually made from iron, tannic acid, and gum arabic. Other recipes existed, and some ink contained charcoal or the soot from a lamp. Some ink stayed black over time, and some turned to lighter colors.

Iron gall ink began with the acid produced in an oak tree when it hosts a gall wasp. The wasp lays an egg in the bud of an oak tree, and the larva produces a marble-sized ball as its early home. It drills its way out as a mature insect, leaving behind the gall. These galls were filled with tannic and gallic acid. Tannic acid is a mordant used in dyeing; a mordant binds the dye color to the cloth chemically. The acids were obtained by crushing the galls and soaking or boiling them in water or vinegar. Ferrous sulfate, called copperas, was a naturally occurring iron-rich mineral. When it was mixed with gall acid, it turned brown and then black. Gum arabic added to the mix made it dense enough to be picked up by quill pens.

Iron gall ink turned darker with time as it bound with oxygen in the air. If it was used fresh, it could be too light for the scribe to see his letters easily. But after it blackened, it remained dark and clear. Some iron gall ink found in early medieval manuscripts remained clear black for a thousand years.

Other colors of ink were used for special purposes, not counting the paints used to create pictures on a page. While blue or green ink could be used, red was the second color choice. On a **calendar,** red marked special days, and a red letter marked a special place on a book's page. Red ink began with the egg white base called glair. Vermillion, an artificial form of cinnabar, mixed into the glair with gum arabic. Brazilwood chips were the other common red tint for book ink.

Not all writing was done with pens and ink. People who needed to take quick notes at work needed a way to write things down for a short time without using expensive parchment or paper. For this, they used wax tablets. The best writing tablets were made of carved ivory, but lesser tablets were wooden with a layer of wax. People used a bone or metal stylus to scratch lightly into the wax.

See also: Books, Painting, Paper and Parchment.

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Pilgrims

Since the earliest days of Christianity, believers had felt closer to their deceased friends and leaders when they were near their burial places. They came to believe that these bones and burial sites had a special holiness. When Emperor Constantine converted to Christianity, his mother Helena traveled to Israel and the Sinai Peninsula to find Mount Sinai, Calvary, Bethlehem, and other sites from Bible stories. She believed she had found these places, and Constantine ordered a church to be built over the site where Jesus had been buried. From that time on, Christian believers began traveling to Jerusalem and Rome to experience the special holiness. During the Middle Ages, pilgrimages became big business. By the close of the medieval period, pilgrimages had travel guidebooks, souvenirs, cruise packages, and a host of official and illicit businesses based on pilgrim travel.

Pilgrim journeys could be long and dangerous or relatively short and easy. Any trip to a **saint**'s shrine was a pilgrimage, and every region had its own saints' shrines. French pilgrims could travel to Saint Denis in Paris to venerate the tunic of the Virgin Mary, and English pilgrims could go to Walsingham to venerate Mary in a shrine built as a replica of her early home where an angel had appeared. Englishmen could go to Canterbury and visit the relics of Saint Thomas the Martyr, a medieval celebrity in his own right. Italians could take a ferry to Venice to pray before the bones of Saint Mark. But pilgrims felt that their journeys had more merit if they were more difficult and expensive. The most important pilgrimage sites were Constantine's Church of the Holy Sepulcher in Jerusalem, Spain's Cathedral of Saint James at Compostela, and Rome, the burial place of Saint Peter and Saint Paul and the home of the Pope.

Until the 11th century, the constant trickle of European pilgrims to Jerusalem met no real obstacles from the new **Muslim** regime. Each Muslim dynasty had a different attitude and approach to outsiders and their religions. In 1095, the Pope heard reports that pilgrims were being harassed and turned away, and these reports led to the call for the first **Crusade.** The Crusaders established Latin-speaking kingdoms between Jerusalem and Antioch (in modern Turkey). Pilgrims took advantage of their newly favored status and began coming to Jerusalem in greater numbers. Two monastic orders of **knights** were established to help and protect them. The Knights of the Hospital managed hospices for pilgrims (and, in some cases, **hospitals** for the sick and wounded), while the Knights of the Temple were supposed to guard the roads to keep them safe. The Crusades ended up changing the political balance and international trade, but they were always closely intertwined with the ideals and needs of pilgrims.

Pilgrimages were undertaken out of a variety of motives. Some noblemen made pilgrimages to Jerusalem in order to be knighted at the Church of the Holy Sepulcher at midnight. Many pilgrims were expressing religious devotion, pure and simple. These included monks, priests, and lay people who felt their religious belief deeply. The most famous late medieval pilgrim was Margery Kempe, who published a detailed account of her pilgrimage to the Holy Land. Her motive was fanatical, emotional piety, and she believed God had called her to be a pilgrim. Like Margery Kempe, many people, both lay and cleric, had a lifelong romantic vision of finding true meaning in life by sacrificing comfort and safety to go to the Holy Land.

Other pilgrims had made a vow in a time of trouble—if a saint helped them, they would make a pilgrimage to that saint's shrine. When they fulfilled this vow, they always gave a gift of money at the church. Often, they left a small memorial image of the way their prayer had been answered. These were frequently made of wax and sometimes of ceramic; least often, they were made of **silver** or **gold.** A tiny ship represented being saved from shipwreck. A wax leg meant a leg had been healed. Wax images left at these shrines range from babies to houses to ships to mysterious objects understood only by the donors.

Pilgrimages were very often undertaken as penance, seeking forgiveness of sin before life on earth ended. The **church** promised forgiveness of sin could be won by meritorious pilgrimages. Penance could be voluntary, as when a knight felt he needed to find forgiveness for the violence of his way of life. It was also often involuntary, imposed as a penalty by a judge. The promise of a pilgrimage could be part of a plea bargain. It could also be part of a treaty—the defeated city or baron had to promise to go on pilgrimage to repent of rebellion or war.

When a pilgrimage was taken for penance, the pilgrim had to arrive at the place and present himself to the abbot, bishop, or priest. There was a set of

In medieval art, pilgrims are indicated by simple dress, staffs, and brimmed hats. Here, the artist documents stages of the pilgrim's journey to the Holy Land. A group of pilgrims could only travel so far by foot or horse, and then they had to contract with a ship to ferry them across part or all of the Mediterranean Sea. Many discomforts and dangers lay ahead. (Bettmann/Corbis)

rituals to undertake for a set amount of time. Some pilgrims began to crawl or bow from when they first saw the destination and remained in that posture until they arrived. Some penances imposed further penalties and hardships. A repentant knight or an aristocratic lady often vowed to make the trip on foot, or even barefoot, so his or her feet became cut and bruised to show repentance. One arrogant count was sentenced to wearing shackles as he made his court-ordered pilgrimages.

Pilgrims wore certain badges and kinds of **clothing.** Crosses, red or white, were the particular mark of a pilgrim. The cross would be sewn onto their cloaks and **hats;** their hats often had a practical brim since the pilgrims would be out in all weather. Men allowed their beards to grow, and all carried staffs. They carried only small bags, for theirs was not a trip of luxury. Pilgrims were expected to be unkempt and not have many changes of clothes.

Both the bag and the staff were blessed with holy water before the pilgrim set out. The bishop or priest gave the pilgrim a letter certifying his or her status as a real pilgrim, since there were thieves who posed as pilgrims. The pilgrim had another task before setting out; he or she had to settle all debts and make a will. There were many dangers, and some pilgrims did not return home.

After a pilgrim had reached his destination, he often displayed some memento of the place on his hat. A palm stood for the Holy Land and a scallop shell for the beach at Compostela. Many shrines sold badges made

Even in the Middle Ages, tourists wanted to leave their mark on places they visited. Medieval pilgrims to the Church of the Holy Sepulcher scratched crosses and their names onto the building's stone walls. (Alfred J. Andrea)

of **lead** or pewter. Each one depicted the saint holding some symbols of his life or death or of the miracles done at his shrine. Pilgrims collected badges and pinned them onto their clothing. On a typical pilgrimage, they stopped at all shrines along the way, visiting the **relics** and collecting badges.

Pilgrims wanted to come home with more than just badges. Many carried mementos for friends who could not come and brought these rosaries or crosses into each shrine to take in some of the holiness the relics could impart. Some had been commissioned with bringing home holy relics for friends and family or for someone who was very sick. They might chip off a piece of the tomb; Saint Martin's at Tours had to put up a railing to stop people from taking pieces of the stone shrine. Some souvenir relics could be as simple as a strip of linen held as close as possible in the presence of the saint's shrine to soak in the holiness. Pilgrims also mixed oil with dust from the tomb or burned a little oil on a cloth by the tomb. There were often peddlers in the area, trying to sell bits of bone or hair that they claimed were from that saint or some other. In Jerusalem, there were many bits of wood passed off as shards of the true cross, thorns purportedly from the crown of thorns, or bottles of saints' tears or blood.

A typical pilgrimage from England to Rome took 50 days each way. **Monasteries** that released monks to go on pilgrimage to the Holy Land allowed a year. Pilgrimages to Compostela from France or England took only

a few months, while a pilgrimage to the nearest shrine (Canterbury or Walsingham for Englishmen, Saint Denis or Tours for Frenchmen) took only a few weeks. No journey went as quickly as possible; everything was subject to delays due to sickness, weather, and storm.

A pilgrim's journey usually took him over mountains such as the Alps or Pyrenees or over the sea. Mountain travel was dangerous due to snowstorms. Storms also came at sea, as did pirates. Pilgrims walked into war zones and sometimes found themselves stuck in a besieged city. Some pilgrims had allied themselves with bishops or rulers whose enemies arrested and robbed them. They were often attacked by ordinary robbers at **inns** and in **forests.** They caught infectious diseases or food poisoning. A silent danger was polluted or toxic rivers in some localities, and pilgrims or their horses could become sick from drinking there. The locals could not always be trusted, since they might reassure the traveler that the **water** was perfectly safe only to skin the dead horse or make off with the dead pilgrim's money.

Pilgrims had to avoid carrying **coins.** Many pilgrims funded their journeys through begging. Wealthier pilgrims paid a deposit with a merchant's banking service so that, at a certain destination, they could receive the sum in another currency to fund the next stage. Some who began with sufficient funds ended up begging in order to make it home after misfortune and robbery.

Certain orders of knights formed to protect pilgrims. The Knights of Saint James were supposed to guard the region of Compostela. The Knights of Malta began as an order that ran a hospice for sick pilgrims in Jerusalem. Some of these orders ran hostels for pilgrims along the road. The Templars, especially, also acted as bankers for travelers.

There were also simple travel services for pilgrims. Literate pilgrims wrote **books** about their travels, and, if they had been along a route more than once, some wrote guides and **maps.** These maps showed strips of **road,** not as the road really lay on the true geography but as a string of places the traveler encountered. They marked unsafe water, good inns, and robbers' haunts. Guides could be hired, but it was always a risk. Was the guide honest, or was he planning to lead the pilgrims' group into an ambush? Pilgrims had to hire **horses** and mules along the way, as well as **boats** and **ships.** Guidebooks told them which rentals and junkets to avoid.

The city of Venice was not only a pilgrim destination itself, it was also a chief travel hub to the Holy Land. Ship owners organized hostels and travel junkets for pilgrims who arrived in Venice. The doge, realizing how important a hub Venice had become, extended protection to all pilgrims. The city offered advice and shelter, and there were offices where returning pilgrims could report complaints about Venetian ships. The galleys were owned by the city of Venice, and all captains were supposed to follow protocol for how they charged and treated their passengers.

Monasteries took in pilgrims as they traveled. In some places, there were no inns, and only monasteries and convents would take in pilgrims. Inns, when they existed, varied in comfort and security. In some places, travelers slept in the same bed together. Frequently, they stayed together in a main room, even if they slept on the floor or on separate cots. Robberies were frequent. Pilgrims could also rent a house for a few days, if they were able.

In 1300, the Pope declared a Jubilee year for pilgrimages to Rome; pilgrims could expect a plenary indulgence—the forgiveness of not just a few sins, but of all. Rome was packed to capacity as pilgrims poured in from all over Europe. In 1350, the Pope declared another Jubilee year. Europe was barely recovering from the plague and had lost as much as one-third of its population. Still, with a keen awareness of death, European pilgrims came in the same numbers as before. After that, pilgrimages gradually lost some of their pious fervor, and by the 15th century, they were drifting toward secular tourism. During the Protestant Reformation, nations that cast off the Catholic Church suppressed shrines and burned relics. The Catholic Church, too, did not encourage pilgrimages as much as before. Skeptics doubted the power of relics, and the pilgrims on the roads to Rome and Compostela reverted to their scanty premedieval numbers.

See also: Church, Maps, Relics, Saints, Taverns and Inns.

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Plague

Medieval people knew many epidemic diseases, although they did not know what caused them. Outbreaks of ergotism, typhus, influenza, and other sicknesses often struck towns. What made the plague stand out was that its symptoms seemed to include every possible malfunction of the human body. It spread fast and killed quickly, and its victims experienced symptoms of many illnesses at once.

There were two widespread, devastating plague periods during the Middle Ages. The first was during the reign of the Byzantine emperor Justinian, in the sixth century. The second, which is more famous, came to Europe in 1347. At the time, it was called the Great Mortality, but we now call it the Black Death. Between these plague periods, we have no records of mass epidemics. Infectious disease on a large scale seems to have been unknown for nearly 800 years. The two pandemics that bookended the Middle Ages shaped its political and social history. Both epidemics cut Europe's population in half, disrupting empires and traditions.

The Plague of Justinian: 541

Records from this early medieval plague are limited. The outbreak was first recorded in Constantinople in 541, and it is commonly called the Plague of Justinian. It may have begun in Egypt and moved north to Constantinople with imported grain. The plague eventually spread all around the Mediterranean Sea and into Europe, Asia, and North Africa. The death rate may have been as high as 50 percent in many places. The plague subsided, but it returned in waves for another two centuries.

The plague's effect on the fading Roman Empire was severe. During the sixth century, barbarians were attacking Italy. The plague weakened Italy's defenses and permitted the Goths to invade freely. Justinian was not able to defend Italy due to his army's losses to plague. The Byzantine Empire was weakened in the East, as well. When **Muslim** Arabs invaded Palestine and Syria in the seventh century, the depopulated Byzantines, also weakened by wars with Persia, could not defend their territory.

The Black Death: 1347–1350

In the prelude to the greatest worldwide pandemic in history, there was a series of catastrophes. Seismic activity in Asia sent clouds of volcanic ash into the atmosphere, which accelerated a general cooling trend in the **climate.** At several points in the early 14th century, winters were harsher than usual, summers were cool, and it rained so much that crops were ruined. In each famine period, as much as 10 percent of Europe's population died of starvation. The Hundred Years' War between England and France began in 1337 and left the French countryside traumatized, often with burned land and ruined houses. In Italy, civil wars between rival families and **cities** were so frequent that the Popes chose to live in Avignon, France, rather than in Rome.

The Black Death, as the plague of 1347–1350 is now called, attacked a weakened worldwide population. It is difficult to estimate how many people died during the Black Death. Some **records** seem accurate, and some

After the plague, people's image of death changed. Death was often pictured in art, and the character of Death was always gruesome and corpse-like. Sometimes Death drew people into a dance, but other times, as in this image painted about 25 years later, Death relentlessly chose unwilling victims to murder. (Werner Forman Archive/ StockphotoPro)

do not. Estimates based on records of estates, churches, and families calculate death rates that range from 25 percent to 60 percent. Mortality varied, as well. Some villages were completely wiped out, while others survived and kept their work going the whole time. In Ireland, one of the last regions visited by plague, native Irish who lived in the hills were struck lightly, while the English living in coastal towns died at rates similar to England's. It is difficult to determine the death rate for any one place, let alone for a larger region. The most common mortality rate used for Europe as a whole is 30 percent. At least one in three people died; in some towns it was closer to two in three. Some cities had a death rate of close to 50 percent.

Symptoms

The hallmark of the plague was an egg-shaped swollen lymph node on the groin, in the armpit, or on the neck. The modern name for this swelling is bubo, from the Greek word *buboin,* meaning "groin." From this term comes the name "bubonic plague." As the patient grew sicker, more lymph nodes swelled. A bubo could grow large, to the size of an egg or apple, or it could remain small. They were usually acutely painful, and sometimes they burst open, oozing black blood. As the illness progressed, many patients also developed bruise-like markings on their arms or legs.

The violent symptoms of the plague often began with coughing. The illness attacked the lungs early, and the patient coughed blood or, having swallowed some, vomited blood. As the patient grew sicker, blood was discharged from the anus, as well. Patients developed high fevers in most cases. Another symptom that all contemporary observers recorded was that sick people smelled very bad. There was a particularly offensive, rotting odor on the breath and bodies of the sick.

The plague of 1347 was extremely contagious. Contemporaries reported that people became sick from touching something a sick person had touched or from merely looking at a sick person. **Animals** also caught it. The plague altered its form during the epidemic. Those who caught it first were most likely to fall sick quickly and violently, and not always with buboes. They died within two days. Those who fell sick during the later stages of the epidemic always developed buboes, but their lungs were not as affected. Some of these recovered; those who died were sick for closer to a week.

There may have been three forms of the infection, depending on where it settled. The form that is most common now, the bubonic form, is also the least contagious and least fatal. The infection is mostly in the lymph system; it is not spread through casual contact, but only by fleabites. The infection can also be pneumonic, in the lungs. Pneumonic plague produced the bloody coughs and rapid, airborne contagion. In the rarest cases, plague can go straight to the bloodstream in septicemic form. Septicemic infection

results in rapid death, within hours, because the massive amounts of bacteria overwhelm the body before the victim has time to develop other symptoms, such as buboes. The outbreak of 1347 may have been predominantly pneumonic, with some cases of septicemia, based on the descriptions of observers.

Spread through Europe

The European outbreak of 1347 was heavily documented by many writers, since literacy was widespread by then. We have records from towns and cities, parishes, bishops, private individuals who kept journals, and at least two well-known writers, Petrarch and Boccacio. Boccacio was in Florence when the plague struck, while Petrarch was in Avignon, where his beloved Laura died from the plague. We know a great deal about the plague in Italy and England, where meticulous record keeping went with large-scale commerce, but we know relatively less about Spain and Germany.

All sources from around the Mediterranean agree that **ships** from Genoa spread the infection first. Genoa had established a colony, called Caffa, on the Black Sea. It was on the Crimean Peninsula, where modern Feodosia is located. Inland, the Tartars had conquered Russia, and war broke out between Caffa and the Tartars. The besieging Tartars caught the plague, and, as they became too sick to fight, they flung dead bodies into Caffa. The plague spread in Caffa, and some escaped in ships and headed back to Genoa. It is less clear what happened after that because there were reports of Genoese death ships in Constantinople, Sicily, Sardinia, Italian ports such as Genoa and Naples, and Marseille. It seems unlikely that the same ships from Caffa called at all these ports, since their crews were dying rapidly. What is clear is that the trade network, extremely active in the Mediterranean by the 14th century, rapidly spread the highly contagious infection.

Constantinople, at the mouth of the Black Sea, was the first region to fall sick in great numbers. Genoese ships passed through the Aegean Sea and reached Messina, Sicily. Sicilians rapidly caught the plague, and it passed all through the island. The Italian peninsula followed, and, at the same time, the plague entered France through the port of Marseille. It spread rapidly through these regions. As the rumor of the Genoese death ships spread, ports became unwilling to allow ships to stay, and some cities drove them away violently. The city of Genoa itself drove off its ships with burning arrows.

The plague was so highly contagious, though, that nothing could hold back its march through Europe. By the end of 1347, Messina, Marseille, and Genoa were infected, and a month later, Avignon, Venice, and Ragusa were sick. In March and April of 1348, the plague entered Spain and

infected the inland Italian city of Florence. In June it entered Paris, and around August 1348, the plague came to Rome and to the coast of England. As the plague spread throughout France, London was struck in the fall of 1348. Around April 1349, an English ship brought the plague to Norway, where it spread into Sweden. Coming from a different direction, the plague was in Germany around June 1349, beginning with Bavaria and Vienna. It entered Poland in the summer of 1349, and by the winter of 1350, it had reached Scotland. Ireland had a lighter case of plague, and the disease did not reach Iceland at that time. In 1352, the plague reached distant Moscow. During the same years, the plague also spread through the Middle East, ravaging Egypt, Palestine, Arabia, and North Africa.

In each place, the plague lasted for about a year and then died out. New cases became weekly, rather than daily, then every few weeks, then monthly, and finally there were no new cases. In 1349, Italy's plague ended, and relief from plague followed in other countries at the same pace the plague had entered.

The plague continued to return in waves until the 17th century. Although the disease was not native to Europe, it was established in the local rat population for two centuries until it finally died out even among the rats. Europe continued to lose up to 10 percent of its population with each wave of plague; the wave that followed the Black Death, in 1361, struck down many of the children born since the first plague.

Treatment and Prevention

Medieval medical ideas were based on the late Roman works of Galen, who lived through a similar plague but did not absorb its lessons. There was no workable theory of contagion, and physicians debated whether diseases were passed from one person to another, rather than through bad air or a pernicious astrological combination in the skies. The medical faculty of Paris determined that the plague's severity was due to a bad conjunction of three planets in 1345. This created a disturbance on the planet, causing bad air; poisons from the earth had been drawn out into the atmosphere. The physicians of Paris recommended that south-facing windows should be blocked off to guard against warm, damp air. In Spain, Arab doctors held the same views but were not permitted to recommend preventative measures. According to Islam, people lived or died by God's will alone, and a belief in contagion was irreligious and dangerous.

The prevailing idea that bad air caused the plague pushed many people to use pleasant-smelling flowers or **spices** to avoid infection. They carried small bouquets under their noses when they went into the streets, and those who could afford cinnamon or cloves used lockets or pressed the spices into oranges and carried them. The other prevailing idea in **medicine**

was that the proper balance of the body maintained health, so especially at this time, people needed to keep a temperate diet that was properly balanced.

Medieval writers recorded extremes of behavior among their fellow citizens. Some became terrified of the bad air and contagion around them and isolated themselves. The Pope survived the plague by remaining indoors with roaring fires going at all times. Others took in supplies for a few months and shut themselves inside with their families, boarding up windows and bolting doors, hoping the plague would pass them by (it worked in some cases). Some responded to the overwhelming death rate by living carelessly. They believed that an excess of **food,** drink, and dancing would drive off the humors of the bad air and keep them balanced. They went to **taverns** and entered private homes, looking for alcohol and fun. Still others fled the city and went as far into the country as they could, hoping to escape the contagion. In most cases, it was futile.

Cities did have rudimentary ideas about waste disposal and proper burial of corpses to try to control infection. The cities that retained basic services throughout the plague organized a daily collection of bodies on biers or, in the case of Venice, by **boat.** When the cemeteries filled, they dug trenches or pits, layered the bodies in with some charcoal ash or dirt, and covered the top as well as they could. In many cases, the sheer number of the dead made it difficult for cities to bury them well enough to keep dogs from digging them up and spreading more infection.

Although the people of that time had no concept of microscopic organisms that could pass from one person to another, they also knew that being close to a sick person was dangerous. Care for the sick and dying, which was normally orderly and thorough, fell apart in most cities. In Florence, where the public order nearly broke down, relatives abandoned the dying, even their own children. Although many or perhaps most families continued normal care for their sick, the terror of the plague was too much for some.

Across southern France and Germany, a rumor spread that **Jews** were causing the plague by poisoning the water supply. The town of Chillon, in the county of Savoy, sent letters to other German towns to warn them that a Jew had confessed to the plot. Although the Pope, the king of Aragon, the duke of Austria, and some city governments tried to protect the local Jews, people in Germany, Flanders, France, and Spain massacred their Jewish populations. Strasbourg recorded the death of 16,000 Jews; in Mainz, where Jews struck back and killed 200 Christians, 12,000 Jews were recorded as dead. The Jewish population of Germany, from the Swiss border to the northern towns on the Baltic, became extinct. Some Jews fled to Poland and Lithuania, where the king of Poland offered them protection.

Effect on Society

During the Black Death, many people believed the epidemic was God's punishment for their sins. A town's first response to the approaching plague was often to organize a ceremonial procession through the streets with a **saint**'s **relics** carried at the front, and they offered many prayers for mercy for the people's sins. But as the plague grew worse, a less moderate religious response began. Centered in Germany, the movement is known as the Flagellants.

The Flagellants were monks and laymen who believed that only a dramatic demonstration of repentance would suffice. They went on **pilgrimages** of 33 days each during which they whipped themselves three times a day. On these pilgrimages, they arrived in a town and led a procession to the church, where they whipped their own backs and each other's with whips that were barbed so as to wound deeply. The townspeople looked on with awe or were pulled into the frenzied emotion. Some joined the Flagellants for month-long pilgrimages, while others went on rampages against the remaining Jews. The Flagellant movement was very popular in Germany and as far away as Flanders, but when it came to England, it met with less enthusiasm. As the plague ended in Europe, the Flagellants went home.

Across Europe, two contradictory social changes took place immediately following the plague. Contemporary writers stated that survivors had lost their moral standards; at the same time, there was a rise in personal piety that began to develop European religion away from the medieval model.

The attitude of "eat, drink, and be merry" stemmed from the immense grief, too great to be fully comprehended, combined with the loss of some social institutions and conventions. Survivors felt very relieved. They pursued fun to drive away the memories and to enjoy life before the next catastrophe. Italian writers observed this trend the most strongly. They reported that women were dressing immodestly and acting immorally and that feasting and drinking were at irresponsible levels.

At the same time, the breakdown of social connections during the crisis had frightened many survivors. They recalled the improper, hasty burials, and they knew cases in which no family members had survived to bury or mourn the dead. Priests were not able to keep up with the demand for visits to the dying or burial rites. Survivors of the plague knew that if another plague struck, they might find themselves with no burial rites or prayers. In many Italian cities, they began to form societies that promised to see to each other's **funerals.** These societies began to do charitable acts, such as caring for the poor, and meet for prayer. Piety became a personal matter, rather than just for monks and priests. There was also a surge of interest in occult **magic** and ways to contact the dead. Witchcraft became a bigger concern than before the plague.

As the Black Death plague hit its peak in continental Europe, the common people of Germany, France, and the Netherlands appealed to God. Men vowed to complete 33-day pilgrimages as Flagellants, walking from town to town and publicly whipping their backs to show repentance for society's sins. These Flagellants are arriving in the cloth-manufacturing town of Tournai, bearing a crucifix and banners. (Ann Ronan Pictures/StockphotoPro)

Europe's pre-plague economy had been based on feudal **agriculture.** When the population of Europe was cut by an average of 40 percent, many estates could not get in their harvests. There were not enough peasants to work the lord's land, and peasants resisted some other feudal provisions. In many places, when a peasant died, the lord's estate took his best animal as a death tax. In a time of extreme mortality, the peasants resisted this tax, which impoverished them when they were already struggling. Feudalism, with its restrictions on where a peasant could live and what he could do, no longer made sense.

Land values dropped. There were not enough people to farm the land, and some acres began to revert to **forest** or swamp. Food production dropped, but, with fewer people to feed, prices for food also went down. The only value that rose was the value of labor. With so few laborers, and so many places to fill, poor men demanded high wages.

Landowners found themselves in a weak position because they had to expend cash in order to get work done that used to be done for free. Their farm produce was worth less, but they paid more to produce it. **Servants**

were hard to find, and more skilled labor positions were now available for them to move into. Landowners in many places petitioned for laws that would keep the old order. With wages frozen and peasants not permitted to leave, their estates could keep running. In England, after at least four more outbreaks of plague, the peasants finally exploded in a revolt in 1381.

When land prices fell and many farms were left vacant, estates, **schools,** and individuals were able to purchase or lease land at good prices. Most historians believe much of Europe had been relatively overpopulated, leaving many peasants without land. Survivors found themselves farming more prosperously, with more to eat.

So many priests died in the plague that bishops had to rush uneducated men into vacancies. The **universities** of Oxford and Cambridge both expanded in the years immediately following the Black Death, so as to train more priests. The educational standard of priests in England rose, as a result.

The plague may also have influenced both architecture and education. Medieval **masons** were highly trained and took years to learn their craft. Some historians believe the deaths of many master masons during the Black Death disrupted the training process. Later masons did not have the skills to create the elaborate stone features of earlier **cathedrals.** Teachers, another educated group, also suffered losses. In England, this may have hastened the shift from French to English as the national language. Until that time, children who went to school (a minority) learned French, but after the plague, schools did not require mastery of French in a teacher, and most children were educated only in English.

Ideas about Causes of the Plague

In the late 19th century, Europeans in India and China witnessed an outbreak of plague that became known as the Third Pandemic. It began in China in 1855, and, over the next 70 years, it spread through Asia and beyond. During this epidemic, researchers could observe and study the plague. The Swiss biologist Alexandre Yersin isolated the destructive bacillus in 1894, and it was named for him: *Yersinia pestis.* By 1900, researchers were certain the plague was being spread mostly by fleas on rats. Fleas are specific to host species. Rat fleas are called *Xenopsylla cheopis,* while fleas that prefer humans (and pigs) are called *Pulex irritans. Y. pestis* is particularly suited to *X. cheopis,* the rat flea. During the Third Pandemic, observers saw many dead rats just before an outbreak among humans; as the rats died of plague, the fleas moved to a less preferred host—humans.

The mechanism of transmission in the flea is dependent on how severely the flea is infected by the bacteria. If the *Y. pestis* bacteria remain in its

digestive tract, the flea is unlikely to transmit it to the rats or other animals it bites. However, if the bacteria begin to multiply rapidly, the flea's stomach becomes blocked. The only way it can restore its own ability to digest blood is to vomit bacteria into the animal it is biting.

Researchers used this knowledge to understand what had happened during the Middle Ages. Rats infested ships, **houses,** and fields. As merchants traveled, their rats and fleas traveled with them. As in the Third Pandemic, the infection was passed through blood contact with the fleas, which discharged *Y. pestis* bacteria into each bite.

However, the Black Death was not entirely like the Third Pandemic. Its contagion moved much faster, and its mortality was much higher. There were outbreaks of plague that did not appear to be connected to the movement of rats, and medieval observers did not comment on the number of dead rats in the streets. On the other hand, excavations where medieval plague victims are buried have turned up traces of *Y. pestis.*

The medieval plague may have been worse due to differences in the population and its ability to handle an epidemic. In the years before the plague, medieval Europe and Asia had suffered several major famines. These famines probably weakened immune systems, especially for **babies** born during the famines; these babies were adults during the Black Death. During the modern outbreak, doctors used public health measures such as quarantine, while medieval towns did not. When modern public health measures broke down, the death rate increased rapidly.

The infection itself may have been a more virulent strain of *Y. pestis.* Some evidence points to an origin not in the rat population, but in a group of Asian marmots called tarabagans. These large rodents live in burrow communities on the steppes of southern Russian and northern Kyrgyzstan, and the Silk Road, a major trade route during the later Middle Ages, ran through their territory. The earliest records of the medieval outbreak, around 1339, come from Lake Issyk Kul, in tarabagan country. From there, the plague spread east to India and China and then west to Europe. It is possible that the strain of *Y. pestis* active among tarabagans was deadlier than the later-studied rat strain. It may have been more likely to develop into pneumonic disease.

A fourth difference may be that the infection spread not only through the rat flea, *X. cheopis,* but also through the human flea, *P. irritans.* Europeans in the 14th century rarely changed their clothes, and they all had fleas and lice. If the infection went from an infected human to *P. irritans* and was then spread by both types of fleas, some of the contagion stories make more sense, especially cases in which it was unlikely that rats moved from place to place.

See also: Climate, Funerals, Jews, Medicine.

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Plays. *See* Drama

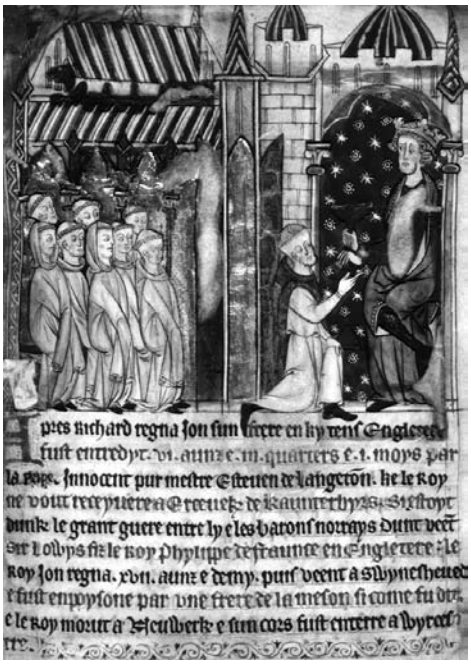
Plow. *See* Agriculture

Poison

Many of those who were poisoned by **food** suffered only from natural bacteria in a time when there was no refrigeration. But many herbal poisons were well-known, and in Constantinople, deliberate food poisoning happened often enough to be one of the most common royal deaths. Kings had to protect against poisoning, and their households did so methodically. Poison could be on a tablecloth, a cup, a trencher, a spoon, or in any dish of food.

Hemlock, a common leafy green plant, grew in several forms. Water hemlock, which grew in damp meadows and by ponds, contains a toxin that causes seizures. Another kind of hemlock, called *conium* in Latin, was the source of the poison Athens used to execute Socrates. One of its alkaloids, coniine, causes muscle paralysis that eventually stops the victim from breathing. Aconite, also called wolfsbane or monk's hood, was a common flowering plant with a natural anesthetic. In concentrated form, it is a lethal poison. The thorn-apple, in Latin *datura,* also has toxins that cause confusion and death. Henbane and deadly nightshade also caused hallucinations and confusion with tachycardia and, if strong enough, death.

Herbal poisons were used to control unwanted **animal** populations. Wolves and foxes could be poisoned with black hellebore, if it was mixed



After King John of England died of dysentery in 1216, rumors flew that he had been poisoned. His death by poison came to be accepted as fact; this painting shows the king accepting the deadly cup. Since medieval monarchs traveled a great deal and were expected to drink ceremonial cups in public, it was hard for them to avoid a cup offered by an apparently friendly hand, like this monk's. (The British Library/ StockphotoPro)

with animal fat and honey. Aconite poisoned rats when it was mixed with cheese. Head lice could be killed with larkspur seeds and vinegar.

Some minerals, too, were known poisons. Mercury, separated from the cinnabar in which it naturally occurred, was used in some technology. Arsenic was used as a chemical in mixing paint and could easily be purchased from an apothecary.

One test for poison was to have a **servant** eat some of the suspect food. The assumption was that the effect of the poison would show up fairly quickly. The other important poison test involved the horn of a unicorn. Travelers to the East claimed they had seen unicorns disinfect water by dipping a horn into it, and some classical writers had claimed it was impossible to be poisoned by drink in a cup made from a unicorn's horn. People also believed the horn would shake or sweat in the presence of poison. Royal households kept the largest possible piece of horn on hand for testing food for poison. Since the unicorn is a mythical beast, the horns were really ivory from an elephant or a narwhal.

Poison on a tablecloth could be counteracted by rolling the unicorn's horn across it. The horn tested the hand-washing water and the hand-drying towel, which was kept on a servant's shoulder, draped openly so everyone could see it did not contain any kind of poison. Everything the king would come into contact with could be tested or made safe by the horn.

Salt was tested by tasting it, and then it was placed at the king's place. Each dish was tested by the horn and by tasting it while it was still in the kitchen. The dishes were brought to the table, covered with clean cloths, under many watchful eyes to make sure nobody tampered with them between the kitchen and the table. The unicorn horn remained at the king's place and was used to test or disinfect every food or drink brought to him.

See also: Food, Monsters.

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Pope. *See* Church

Pottery

During Roman times, potters used wheels and kilns and produced vases, urns, cups, and bowls. In parts of Northern Europe ruled by the Romans, as far north as Britain, potters produced wheel-turned pots in imitation of Roman technique but of poorer quality. The invasion of Germanic tribes disrupted the pottery traditions. During the Middle Ages, skill with ceramics was slowly rebuilt, especially around the Mediterranean, where the Roman crafts were never entirely lost.

Potter's wheels were used in most of Europe through most of the Middle Ages, although some more primitive places used hand-shaped pots. Wheels were usually made with a small shaping wheel on top and a large, heavy flywheel by the potter's feet; once the flywheel was kicked into motion, its weight kept it turning so that it did not need to be kicked continuously.

Unglazed pottery was cheapest; it was molded and fired and had a surface like an unglazed **brick**. Unglazed wares made common cooking and baking dishes and the most common storage or water jugs. The three glazing options were **lead,** tin, and **salt.** Lead glazes had been used all through the Roman Empire. Lead's poisonous nature was not known, so people did not hesitate to add it to drinking and eating vessels. Lead glazes were clear and hard after firing. Tin-glazing techniques were imported to Europe from the Islamic empire, chiefly around Baghdad. Ground tin oxide in clear glaze turned white after firing. Salt glazing was invented in the late Middle Ages in Germany.

After glazing, pottery had to be fired in a kiln. Clay changes its molecular structure when it is exposed to very high heat; it becomes unable to absorb

water. Most of medieval Europe used a kiln of some kind, although in the more primitive Germanic areas during the Dark Ages, pottery firing may have been achieved by burying the wares in bonfire ashes. European kilns used chimneys so that the updraft made the fire hotter. There were usually two chambers, one above the other, and a brick structure that encased the chambers and created the chimney; German kilns were often bottle shaped. Medieval kilns could reach 1,000°C. In 14th-century Germany, the invention of stoneware required hotter kilns with new technology that could reach 1,200°C.

Islamic Pottery Techniques

Ceramics were most highly developed in China, and, during the medieval period, traders imported Chinese ceramics first to the Islamic empire and then into Europe. Chinese porcelain was characterized by its white color, made from kaolin clay, and by its clear glazes and very hard firing. Potters in the Middle East and around the Mediterranean began to copy this as they could. The search for a way to recreate Chinese porcelain pushed Islamic potters to innovate, and their pottery developed quickly and eventually created wares that the Chinese, in turn, tried to imitate.

Several factors unique to medieval Islam shaped the ceramics traditions. Islamic rulers discouraged the use of **gold** and **silver** vessels at table, which meant that ceramics were more in use by wealthy **Muslims** than by wealthy Byzantine Christians. Religious tradition forbade drawing the figures of people or **animals**—it was as if the artist were trying to take on the role of Allah in creation. Although this was not often enforced, there was a general trend to exotic geometric or floral motifs, especially in making **tile** for mosque walls. Bowls and vases sometimes depicted animals or people. As pottery techniques permitted more detailed designs, many dishes had verses from the Koran painted in decorative Kufic script, and this, in turn, influenced other designs.

Chinese kaolin was not available, but potters in ninth-century Iraq created a white glaze that had tin oxide added to it, and it could imitate Chinese white porcelain. Over the next three centuries, they learned a range of techniques of tinting and firing. They tinted unfired tin-glazed wares with cobalt for blue, and **copper** for green, so that when fired, the white dishes had elaborate blue or green designs. Painting the glaze before firing is called inglazing. Then potters learned to paint a white dish that had already been fired, using paint made of silver and copper oxides, before firing it a second time. This is called luster painting; lusterware became the dominant pottery style as it spread into the Mediterranean region. Slip painting was another decorative option. They painted a design onto unglazed pottery using slip, a mix of water and mineral-tinted clay and then fired it with

a clear glaze. Minerals for slip painting produced the colors red, brown, and black. Islamic ceramics with slip painting often have elaborate Koranic inscriptions. Sometimes vessels first decorated with slip painting had a colored glaze, such as blue.

The last medieval ceramics techniques developed in the Islamic countries were fritware and enamel painting. Fritware had large amounts of crushed quartz mixed into the clay to make it both stronger and colored white. Because of its strong composition, it could be decorated with relief carvings, rather than enamel or other colors. Enamel painting was developed in Iran; enamels were mineral glazes that could be painted onto glazed, fired dishes to add new colors and designs. They provided strong colors and were painted with brushes, so potters could achieve good detail. The vessels were then fired again, at a low temperature. Persian enameled dishes had a range of colors: blue, black, green, brown, red, white, and gold or silver leaf. Islamic tile mosaics on buildings favor white, blue, and black because of these techniques. Cobalt for blue was a commonly available mineral in the Middle East.

European Pottery

The Islamic techniques came to the Mediterranean region first, through North Africa into Spain and through trade with Venice. At the same time, the North Europeans had simple pottery methods they continued to use. As with other crafts, northern and southern gradually blended by the 15th century.

In Spain, two traditions competed and finally blended. The Christian kingdoms in the north, based in Visigothic culture, used more primitive pottery techniques, while Muslim Andalusia in the south imported pottery and skills from Egypt. While northern potters were making simple gray pots and pitchers, the Muslim potters of the south learned the Egyptian method of making lusterware. Their twice-fired pottery used crushed silver, copper, or even gold in the second glaze. The metal adhered to the pottery and made it shine. They also imported cobalt for blue glaze. The famous blue and white wall tiles of the Alhambra palace were lusterware with cobalt blue designs. The height of their art was showcased in the Alhambra's collection of large decorative vases covered with intricate designs based on Arabic script.

When the Reconquest made most of the peninsula Christian again in 1248, Muslim potters altered their style to blend Christian and even Gothic elements. They learned to paint heraldic designs. Many moved to the Valencia region, and they exported ceramics all over Europe. The Valencia style, by the close of the Middle Ages, used not just cobalt blue but also other bright colors and had perfected the luster techniques. The Spanish techniques and art were the dominant model for Italy.

In early medieval Italy, the Roman techniques continued to be used, although there was no further development under Gothic rule. Contact with the Byzantine Empire renewed interest in glazes and decorating plain wares. Most lead glazes turned yellow or green. The most common decoration on a vase or jug was to draw a decoration in white slip on the red clay, then scratch through the white slip to allow the red clay to show in lines, and then coat it with a clear lead glaze, which turned yellow.

After 1250, pottery in northern Italy was often covered with white tin glaze that allowed for much more decorative painting. By the end of the Middle Ages, this decorated white pottery was called maiolica. The term *maiolica* came from the Spanish island of Majorca, which served as a shipping point for many tin-glazed wares that originated in Spanish Andalusia and imported the tin-glazing technique from Baghdad. The clay vessels were fired in a kiln and then dipped in tin oxide glaze. After they dried, the potter could paint designs using copper paint that would turn green when refired. When the vessel came out of the kiln, it was pure white with green leaves or geometric designs. Maiolica pottery was very appealing and became a major industry for Florence, Faenza, Orvieto, and other towns. Although the term *faenza* came to stand for the style in Northern Europe, each town tended to have a style of decoration that was distinctive: green leaves in Florence, vines and grapes in Orvieto. As the 15th century passed and Italy moved into the Renaissance period, potters developed more tinted glazes and could paint in a variety of colors.

In Northern Europe, pottery was not as widely used. In the southern regions that produced wine and olive oil, storage jars and pottery lamps were much more important. Wood was the chief building material of the north. In Southern Europe, pottery vessels all through the medieval period included jars, pitchers, bowls, lamps, cooking pots, portable stoves, urinals, trays, and funnels. Northern Europe used metal or wood for many of these vessels and only maintained simple pottery techniques for pitchers, cups, and some cooking pots until the pottery of the Mediterranean began to make its way north through trade.

French pottery in the Middle Ages did not develop much until the 13th century. Before that, they made basic jugs and jars glazed with green, yellow, and brown lead glazes. Norman pottery around Rouen used some white slip decorations and relief designs. Tin glazing came first to Avignon, along the Mediterranean coast, from Italy. The potters began making white tiles that they called faience, after the Italian city of Faenza.

In Flanders and the Netherlands, pottery was plain gray until they found a deposit of red clay in the 13th century. With the red clay, they could make white slip decorations similar to the Normans' designs, and they discovered colored glazes. Flemish pottery was soon in demand; they made jugs and jars, cooking pots, and curfews (fire covers to bank the ashes). Tin

Beautiful maiolica pottery began with Eastern tin glazing. After tin glazing technology came to Spain, Italy, and France, each region developed a style unique to its tradition and aesthetic sense. The style of Valencia, Spain, was modeled on Islamic styles in Egypt and Baghdad, and featured geometric patterns. (Hermitage, St. Petersburg, Russia/The Bridgeman Art Library)

glazing came at the end of the medieval period, in the 15th century. The Low Countries adopted the technology quickly; they began to produce decorated white dishes to compete with imports from China. During the postmedieval period, this industry became famous for its fine dishes, such as delftware.

Most medieval English households used pottery only for pitchers, storage jars in the kitchen, and drinking cups. Pottery cups were most favored by the poor who could not afford drinking horns, silver cups, or even wooden tankards. Potters did not have **guilds** until the late Middle Ages because making pottery was a part-time seasonal activity. After the 13th century, pottery had more status in England, and there were guilds. By the 14th century, potters were making a wider variety of goods, from bowls to cisterns.

The clay of England was typically red-brown; it was sometimes decorated with white slip, as in Normandy. Most early pottery was not glazed. The first glazes used in medieval England were based on naturally occurring lead powder, or galena, which was dusted onto the damp pot. The pots turned yellow when fired, or, if blended with copper, they turned green. The few pitchers and mugs that survived into modern times are typically bright, dark green and very shiny.

After shaping a pitcher on the wheel and adding spout and handle, the potter could use a different kind of clay as slip to make simple designs. Firing lead glaze over the whole finished piece made it glossy and yellow. All of the pottery in a region looked roughly the same, but the slightly different yellow, green, or brown decorations and glazes made each ewer and vase unique. (English Heritage Images)

English medieval pitchers were sometimes decorated with the figures of animals or people pressed onto the upper shoulders of the pitcher. Pitchers still extant today include decorations of dragons, birds, lions, **ships,** and **fish.** Other pitchers were decorated with faces, often bearded, looking outward. Water pitchers for table were sometimes made in the shape of animals or people so that the servants could pour water for guests from sheep or horses. The jugs were carefully made in naturalistic animal shapes with added handles, with the animal's mouth as the spout.

Germany, like the rest of Northern Europe, at first produced simple utility vessels, either unglazed or fired with lead. However, southern Germany had a strong tradition of making highly decorated tiles that were used in walls, floors, and stoves. This led Germany's potters to innovate, and they developed the only new ceramics inventions in Northern Europe.

The Rhine Valley potters invented stoneware, pottery that had been fired in unusually hot kilns until it had fused harder than most pottery and became as hard as stone. The local clay was gray, with much sand in it, and it was well suited to such high firing. It was generally not glazed in the medieval period because the known glazes did not work at such high temperatures. Stoneware was a popular export, and the Rhine River was a good export waterway, so the industry developed in many river towns. Stoneware did not make good cooking vessels, but it was good for storage jars and bottles. It was particularly good for drinking cups. The new beer industry was rapidly growing, and stoneware provided its pitchers and tankards.

In the 15th century, the Rhine potters developed salt glazing. They threw salt into the kiln, and its vapors adhered to the pottery to produce a thin glaze. Because the vapor produced such a thin glaze, the best way to decorate the pottery was by pressing relief molds onto the surface, instead of painting it. Early German salt-glazed vessels are usually covered with very fine, beautiful molded decorations. The natural color of a salt-glazed vessel depended on how much iron was in the clay as it reacted with the salt. The clay around Aachen, in modern Belgium, fired a rich reddish-brown with salt. In Siegburg, the local clay fired white.

See also: Bricks and Tile, Kitchen Utensils, Lead and Copper, Muslims.

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Printing

Books were handmade manuscripts until printing made mass production possible. During the early 14th century, the first printed books appeared. Movable type had not yet been invented, but these books used woodcuts, also called block prints. Flanders and the Netherlands region were the most active areas in printing block books. The production of block books continued for many years even after the development of the printing press and its key element, movable type.

Making a block print involved using a piece of wood and cutting away the white space, leaving the surface of the block as the picture or letters. The block was cut with the image reversed, left to right. When the artist applied **ink** and pressed the block firmly down on **paper,** the image would be correct. These block prints were probably originally designed to be hand colored, but most remained as black-and-white images. Printers were able to make use of color by applying red, blue, or even **gold** ink to an opening initial or other decoration. Block printing was much faster than handwriting a manuscript, and the block could be used again and again, until the pressure on the ink-wet wood finally caused it to wear out.

The earliest woodblock prints that we know of were used for religious instruction; they have woodcut pictures and hand-lettered text. **Saints'** lives and Bible stories dominated all medieval literature. *Apocalypse* was an important series of block books, with pictures telling the story from the last book in the Bible, the "Revelation to Saint John." *Apocalypse* was published in at least six different editions. Another very influential block book was *Ars moriendi,* "The Art of Dying." It showed devils tempting the dying man to lose his faith, and then angels helping him remain steadfast to the end, in several scenarios of various temptations. Another widely known block book was *Incipit biblia pauperum,* the Poor Man's Bible. Each picture shows a central scene from the life of Jesus, flanked on the left and right by pictures showing (respectively) Old and New Testament scenes or stories that teach the same lesson.

Woodcuts allowed printers to manufacture playing cards. Cards became popular, especially in Northern Europe, and card playing inevitably led to gambling; German records from several **cities** indicate that gambling

became a huge problem and that cards were banned in the late 1300s. There were also other kinds of cards that people gave to one another, an early form of greeting cards.

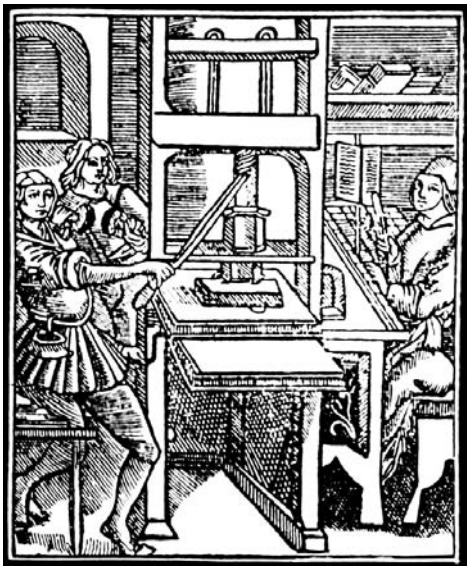
By 1450, all of the needed materials and most of the necessary technology were in place for the invention of printing. There were mills that could supply paper in quantity. Artists had begun using oil-based **paint,** and an ink that would work on metal type could be produced the same way. The screw press, which produced the kind of firm and even pressure needed for printing, was already in use for block printing on **cloth** and paper, among its many uses. Goldsmiths knew how to do metal casting; they had stamping tools with small metal letters to imprint book covers and make coins.

The one requirement for printing that was not yet in place was the ability to make large quantities of metal type that was both moveable and reusable. The type needed to be small and must be cast so that each little letter (a "sort") would be on a perfectly square base to fit tightly against other letters. The type had to be reusable, and the sorts needed to be easily and quickly made in the quantities necessary for a printed page. Two related inventions also were needed: a tool that would hold the type while the printer was assembling a line (a "compositor's stick"), and a frame where the whole page could be tightly assembled to go onto the press (a "chase").

Johann Gutenberg of Mainz, Germany, was probably the first printer to solve all these problems. The primary work for which Gutenberg is known is the Gutenberg Bible, commonly called the 42-line Bible. It was created during the 1450s; from examining the details of the type, experts conclude that six compositors worked on the Bible, probably for at least two years. The Gutenberg Bible was the first major book produced with true movable-type printing.

Trained as a goldsmith and metallurgist, Gutenberg set up a shop to mass-produce souvenir mirrors for **pilgrims** going to a shrine at Aachen. He also had a press on which he printed woodblock playing cards, among other things, but he was working on developing movable type. In 1448, he used a form of moveable type to produce a highly successful Latin grammar textbook known as "the Donatus"—the name of its author, a monk and scholar who lived in late Roman times. Using the same type, Gutenberg printed one-page papal indulgences—in press runs of 200,000—for Pope Nicholas V, who was trying to raise money for a **Crusade** to Cyprus. A few copies of the indulgence are extant, as are some other very early printed objects—a scrap of paper with a portion of a poem printed on it, a 1448 calendar that was printed with freshly cast metal type, and a Bible known as the 36-line Bible.

During this time, Gutenberg also experimented with making a more efficient press by combining elements from several kinds of industrial presses. He probably had a fair-sized staff working for him on these projects,



The first printing press used recently developed screw-press technology. To print one page, the printer had to ink the sheet of type, load a paper into the press, and turn the press's screw. The unique innovation of the process was in casting lead letter dies that could be melted down when they grew dull and quickly recast. (Francis Rolt-Wheeler, *The Boy with the U.S. Inventors*, 1920)

including calligraphers, designers, pressmen, and metal workers. His major contribution, however, was developing a handheld adjustable mold that could make the thousands of small metal pieces of type—the sorts—that were necessary for efficient and flexible printing.

To make a sort, the craftsman first carved a letter in relief, in left-to-right reverse, in the end of a steel punch. This process required several tools, including files, a counter-punch, a graver (a small cutting tool), and a specialized graver (a scauper) to cut out the center of round letters. With a hammer, the craftsman punched the letter into a soft **copper** blank to make an impression called the matrix and filed it smooth. He then inserted the matrix into the handheld mold and used a small funnel to pour a mixture of **lead,** antimony, and bismuth into the mold. This alloy was used because it melted at a low temperature and also cooled rapidly. The finished letter, on its square lead base, was dropped onto a tray to cool. The mold was adjustable so that thin letters like the small *i* or *l* had a thin base and larger letters like *M* or *W* had a wide base. The mold also made special characters like numbers, the dots used as punctuation, decorative capital letters, abbreviations, and ligatures.

An experienced worker could make four to six sorts a minute; this efficiency made it possible for the shop to produce thousands of characters in a day. In Gutenberg's shop, the number of different characters was very high; experts studying his printing have counted 290 alternate characters. Gutenberg greatly admired handwritten manuscripts and wanted his books to have that look. Therefore, he had his men make several versions of some of the letters (for example, eight versions of lowercase *e*) in a Gothic script,

with slight differences between them so the finished book would look handwritten.

The first step in printing a book was to set the type. The compositor had to be an educated man, with a good grasp of grammar, spelling, Latin, and even Greek. He sat in front of two cases where the sorts were kept in compartments, capital letters in the upper case and little letters in the lower case. (We still speak of letters as uppercase or lowercase.) As he read from the manuscript, he placed the type line by line in a composing stick; each finished line went into a galley (a shallow tray, open at one end), and the finished page was locked into a chase.

The chase was then placed on the press stone (a large piece of marble) and inked. The water-based ink that was used in manuscripts or for wood-block printing was not suitable for printing with metal type because it would not adhere to the metal. Printers developed a linseed oil varnish similar to what artists had begun to use as oil paint. The ink used for the Gutenberg Bible had a high metallic content of copper, lead, and titanium, which made the ink somewhat reflective, a quality it still has in extant copies. To apply the ink to the type, the inker used two "hemispheres" made of leather and equipped with handles. A hemisphere in each hand, he dipped the leather into the ink and pressed it against the type, trying not to splatter.

The night before printing, paper enough for the next day's printing was wet down and stacked to partially dry overnight. At printing time, the moisture still in the fibers made the paper absorbent enough to take the

Gutenberg's first movable-type press produced many smaller works to produce quick profits, but the masterwork was the full Bible. Gutenberg admired hand-copied manuscripts and tried to preserve some of their artistic style in his printing. (Library of Congress)

ink. The press itself was like a vise with a screw mechanism that pressed a plate (the platen) firmly down. It was an adaptation of the winepress, enhanced by some features from textile and paper presses. After a page was printed, it was set aside to dry, and another sheet of paper was placed on the press. The sheets had more than one page printed on them, and they had to be printed on both sides. Extremely careful planning was needed for the pages to be correct when they were cut and folded into quires (sections of the book). Decoration (colored initial letters and so on) was done by rubricators. The finished cut and folded pages were gathered into groups of pages and sent to be bound between leather-covered boards.

Gutenberg's invention revolutionized printing, and printers' shops all over Europe were soon using the new methods to meet the demand for books. German printers particularly set up print shops in several other countries, including England. It is estimated that between the invention of printing and the end of the century, a period of only 45 years, more than 10,000,000 books were printed.

The first printer in England was William Caxton, who published over 100 books during the late 15th century. Many of them were his own translations. Originally a wool merchant, he learned the printing trade in Cologne and set up a press in Bruges, where he printed the first books in English. When he returned to England, he brought eight fonts of Gothic type and set up a printing shop of his own. His early published books included Chaucer's *Canterbury Tales, Troilus and Criseyde,* Malory's *Morte d'Arthur,* and many others. Caxton is equally well-known for editing some of the books he published and for helping standardize the English language through his publishing. He sought to follow what is known as the Chancery Standard, a written form of English developed during the reign of Henry V in the early 15th century.

See also: Alphabet, Books, Games, Parchment and Paper.

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Prisons

City prisons were a new development after the 12th century. They housed debtors, prostitutes, and thieves. At first, they were not intended as punishment in themselves; they housed those who were awaiting sentences or debtors who could be freed if their debts were paid. Before that, crimes had been handled at the most local level; the landowner locked up a suspect and had a trial quickly, if at all. By the 15th century, prison time itself was used as civil punishment.

Punitive sentences began as a means to limit the suffering of poor debtors who could never buy their release because they would never be able to pay their debts. Around 1300, cities like Venice began to translate the amount of debt into time spent in prison. Since many of these debts were really fines imposed by the city, the city could make a formula for what length of time in prison was equal to a fine.

Into the 14th and 15th centuries, citizens could receive sentences of varying lengths for failing to pay fines, breaking curfew, gambling, failing to defend a ship against pirates, bigamy, assault, or breaking the city regulations of a craft. While some sentences were as short as three days, some were as long as five years. The average medieval prison stay could have been around two years. Prisons could become overcrowded and release those who had been in the longest. Officials also released prisoners on some church **holidays.**

As cities grew, they had defensive structures they no longer needed. Some cities used old forts and towers as prisons, while others had outgrown their original gates and had massive gatehouses within the new city walls. The city of Paris kept prisoners in the Châtelet, while the city of London used some of its wall gatehouses, including the later-famous Newgate Prison. **Women** were housed in convents at first, in some places, but the nuns complained because many of the inmates were prostitutes and their former customers came to the convents. Cities began to build women's prisons as separate facilities. Because women inmates were vulnerable to abuse, their quarters were made increasingly secure.

Supervisors, from city officials to priests to committees, and including the doge of Venice, visited prisons regularly to make sure prisoners were cared for. Friars often served the inmates, taking care of them as a service and holding prayers and Masses with them. Prisons began to distinguish wards for separating inmates not only according to wealth and rank, but also for violence and disease. Most prisons also developed a lockdown ward for the insane. Inmates could be subjected to corporal punishment within the prison—as a penalty for fighting, for example. They could be flogged or even dismembered; some were executed, if they were violent enough. Most prisoners served their time without incident.

The old Chatelet fortress became a prison as medieval Paris outgrew its early walls and defenses. Its design for keeping attackers out proved successful at keeping criminals in. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

Prisoners usually had to pay fees for their upkeep, as well as other fees and taxes. This payment was part of working toward release. Poor prisoners were cared for at only a basic level; wealthier prisoners could pay extra for more amenities. Since the poorest prisoners could not afford to pay the fees to remain in prison, they ended up staying there indefinitely because the mounting fees were recorded as debt.

Daily life in a medieval prison was above all boring; there was no work, and there were no activities beyond prayers and the charitable distribution of food. Inmates talked, gambled, and fought. They could have visitors, and, in fact, visitors were expected to come frequently and help pay their fees or give them **food.**

See also: Cities, Monasteries.

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Records

Most of what we know about medieval Europe is based on some kind of written record created at the time; the only other record is the archeological one. Examining standing **castles,** excavating buried walls and **houses,** digging in trash pits, and looking at collected artifacts in museums, historians can see some of the setting and props of medieval life. The archeological record is the bedrock of understanding the medieval material culture. But many things have been lost; medieval people and those who came after them were tremendous recyclers who melted, cut, shredded, and burned much of the past. Few clothes have come into the present; over time, they were passed down to younger and poorer folks, cut into children's smocks, made into rags, stuffed into pillows, and sold for **paper** pulp. Whatever could rot or rust often has done so, and only the **stone,** bronze, and **gold** remains.

The written record created at the time does not always tell us what we want to know. The Middle Ages was not a time when the past was valued, except in terms of the wisdom of the ancients, such as Pliny or Aristotle. Italian sculptors carved Roman pillars into **saints,** and Roman plumbing was melted down to make new pipes or lead **pilgrims'** badges. There was little effort to preserve the details of their own time until the 14th and 15th centuries, when some people used the new paper technology to start keeping journals. When they did create records, they were writing about what interested them, from the price of hay that season to the miracles worked at the local saints' shrine. We have to look at what interested them to piece together what interests us.

Moreover, the loss of records has been immense. There were ordinary problems like floods and fires. The Great Fire of London, in 1666, burned more than half the city, and many medieval guild records were lost. In certain periods, people recycled their records as materials for rags or wrappings, to make a list or to mend another book. In other periods, they destroyed them on purpose. When the English closed all the **monasteries** in the 16th century, many books were lost or destroyed. During the French Revolution, peasants deliberately destroyed anything that had belonged to royalty. The 15th-century household account books of Duke Philip the Good of Burgundy were used to make cannon cartridges in 1793; only one volume escaped destruction. Historians would be able to glean many facts about the economy of the time if more volumes had survived into the present.

Written records are both written texts and visual depictions. There are stylized, decorative texts and images, and there are detailed, accurate ones. There are personal accounts and public writings, propaganda and legends. By carefully examining these records, historians can find clues about daily life that the record makers did not intentionally explain.

Visual Images

The only records of medieval clothing are in **paintings** and **sculpture.** By comparing different artists' **book** illustrations and tomb effigies of the same period, we can generalize and understand what people wore. What we cannot know easily is whether the picture is showing something typical or unusual. Book illustrators often showed scenes that were not connected to the text, which was usually religious. There was no narrative to explain the picture. Are these people dressed for a party or wearing their everyday garb? Was this detail, such as **bells** hung from their belts, a fad that year, or did they put bells on for Christmas games?

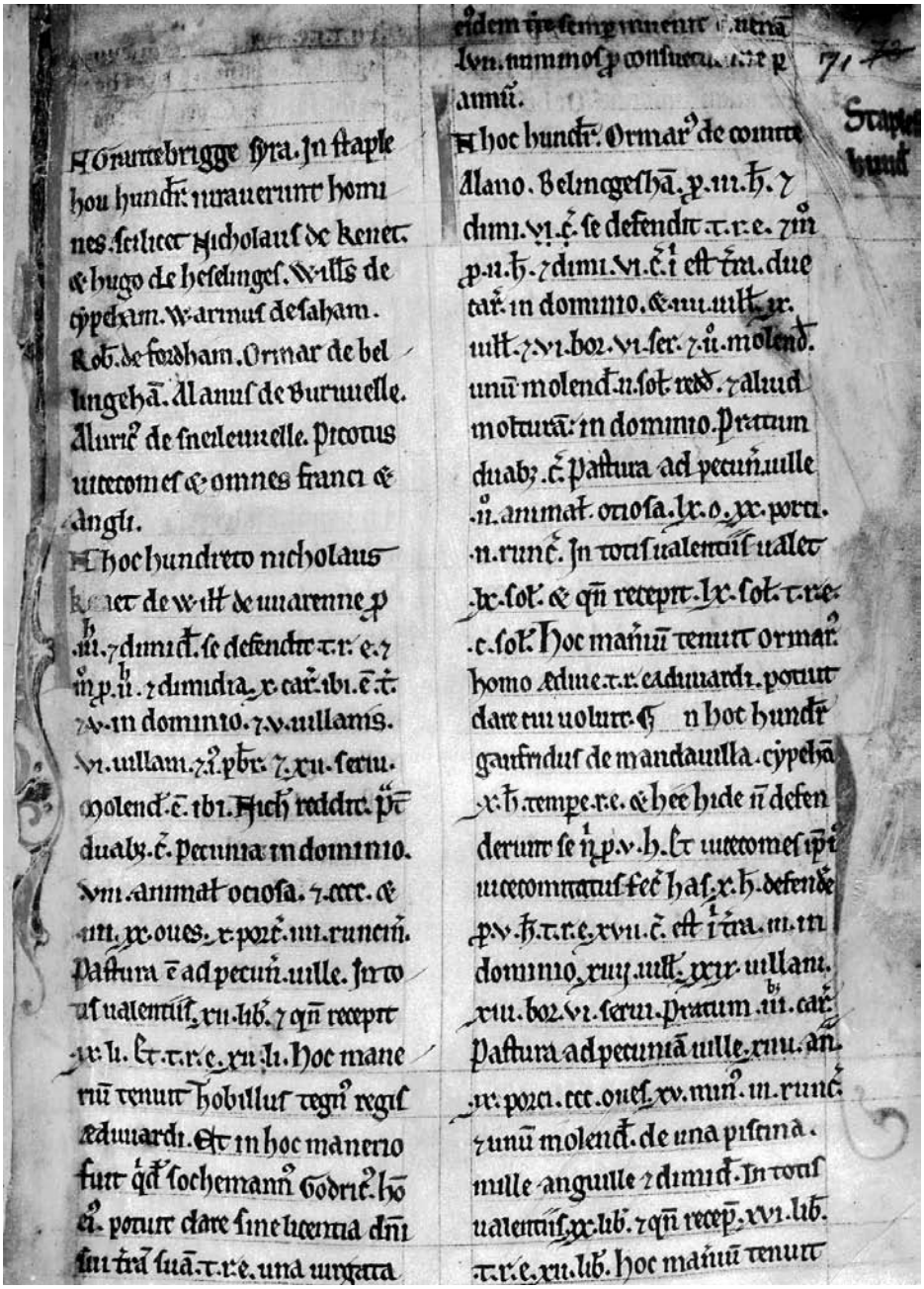
Most of what we know about **tools** comes from pictures. Medieval illustrators drew many scenes of building, so we have hundreds of images of scaffolding, cranes, hammers, and saws. Some crafts were depicted more often than others; we have few images of tanners or butchers compared to **masons** and plowmen. Still, the great variety of imagination that painters could exercise in creating psalters and books of hours means that many activities are shown at least once: sharpening **pens,** pruning vines, cutting leather for **shoes,** polishing **armor,** and many more.

In the 14th and 15th centuries, many more people commissioned memorial brass plaques. Instead of having only a few expensive tomb effigies of queens, for these centuries we have figures of thousands of men and women etched on brass in awkward but detailed formal poses. The names permit us to trace the histories and dates of the people, so we can see with more accuracy what people wore and considered important in different decades and social classes.

Government Records

Literacy came to the Franks with Christianity, and although most nobles could not read until after the time of Charlemagne, they employed clerks to keep records. Frankish estates kept surveys now called polyptychs because the parchment was folded many times. They kept lists of their tenants and how much rent they paid each year. These simple books are among the first records of Europe's economy.

The Franks and Anglo-Saxons kept tax rolls listing all tax-paying adults and how much they were assessed for. In 1085, William I of England, better known as William the Conqueror, authorized a detailed taxation census of his new realm. In the 20 years since his conquest in 1066, he had rewarded his followers with many manors and **castles.** The survey set out to learn how much land was held by the **church** and how many people, plows, and **animals** were on each manor. The book was known at the time simply as "the King's great book," but by the 12th century it was known as the *Domesday Book,* a nicknamed based on the Bible's account



The *Domesday Book* was a tax roll compiled for King William I. Its rigorous detail was unmatched in its time and remained the highest standard for centuries after. Most economic histories use the *Domesday Book*'s database, although it leaves unanswered many questions that modern scholars ask. (The British Library/ StockphotoPro)

of a great book used on Judgment Day, in which every man's deeds are recorded.

The *Domesday Book* preserved a snapshot of the economy in one year. Each county's entry began with a list of the men who held manors in it, beginning with the king himself and including bishops and abbots. Each lord's land was then subdivided into hundreds and half-hundreds. Within each parcel, every manor was listed, with the names of the men who farmed it and how many villeins (workers obligated to stay on the estate) and slaves. The census stated its assessment for taxes and military duty and told how many plows worked the manor. For some counties, the book lists livestock: horses, cattle, sheep, and pigs.

There are official records of legal codes produced under the kings. While we cannot tell how well these laws were enforced, we can get a sense of what prompted the law and what the circumstances were. A particularly detailed legal document is England's Magna Carta, the document that rebellious barons forced King John to sign in 1215. The Magna Carta listed all the ways the king's power had to be limited, and from this we can see what was considered normal. Also in 1215, the Pope issued the results of the Fourth Lateran Councils; the five medieval all-church councils produced detailed rulings on vexing problems of church government. These documents are among the official, intentionally created records of the Middle Ages.

Town and county governments kept coroners' records, and these are among the richest records of medieval life, although they recorded only deaths. In medieval England, inquests asked why the death occurred and took statements from witnesses. A typical entry is short, but it tells the name and age of the deceased and the way the death happened. This tells us what that person was doing at the moment of death and what others were doing. A child falls into a river on the way to **school;** a **baby** is mauled by a pig wandered in from the street; a child is burned to death when a servant's careless candle catches the **house** on fire. Historians can study where accidental deaths occurred and get a good sense of where people were on a typical medieval day.

Manorial and town courts kept records of infractions reported and fines imposed. In many cases, the records are so laconic that we learn little of the lives they speak of. An ale brewer is fined, but the court does not say why, because fining ale brewers was too common for interest. Peasants are fined for taking wood, hay, and animals from the lord's land, but we know nothing more about their lives. Peasants paid fees at events like a **marriage** or a death, but we do not know how harsh the fees were economically or whether they were always exacted.

However, we learn about normal life by reading about what disrupted it. There are records of lawsuits and contract disputes. A modern reader of an apprenticeship contract finds it all so foreign that it seems hard to

understand what could go wrong. Reading a body of court records of apprenticeship disputes, the assumptions and offenses of medieval life become clearer. A medieval father objected more when his son was not properly taught skills and less if he was not treated kindly, unless the unkindness was dangerous. Masters complained most often of apprentices who ran away. **Guilds** were reluctant to break contracts without a period of time for either party to amend his ways.

Dowry, betrothal, and marriage contracts appear frequently in the court rolls, as families argued over whether the terms had been fulfilled. The medieval practices of family law, such as wardship of orphans, would be virtually unknown apart from court records of disputes. We know from court records that orphans' wardships were sold, sometimes repeatedly. We know that both men and women tried to hold each other accountable for promises of marriage, even marriages made orally without a written contract. The evidence of witnesses tells us where people were and what they considered normal in daily life; the incidents they testify about took place in homes, **taverns,** and workplaces. We get a sense of how friendships were formed in the testimonies about how long each witness had known the parties to the lawsuit.

In English village court records, we can observe their method of community policing. If anyone was attacked, he or she had to "raise the hue and cry." In calling for help loudly, that person placed everyone in earshot under the obligation to drop his or her work and run to help. When a village did not respond to the call, the victim could bring a complaint to the magistrate and have not only the attacker but also the village fined.

Personal Wills and Notarial Accounts

Wills, especially in the late Middle Ages, often had detailed inventories of a person's possessions, including clothing, books, dishes, and tools. Much of our knowledge of people's lives comes from close scholarly reading of many old wills. By studying a person's profession, and his or her comparative wealth, scholars can determine how well a profession was flourishing in a time or how much social respect it commanded in society.

Notaries kept records of wills and other contracts in large towns. In the progressive Italian towns, notary service was a well-developed profession. Italy's towns could have had some ongoing notarial services since Roman times, but they at least revived the Roman practice of public notaries when the University of Bologna began to teach Roman law in the 11th century. Italian notarial records go back to about 1150. Charlemagne copied Roman practice by instituting the role of a notary among the Franks, but these notaries were mostly private secretaries for a long time. As private secretaries to princes and courts, the notaries recorded many decrees and court

records, but they did not at first record the family matters of private individuals. During the 13th century, increased trade with Italian merchants brought the institution of public notary services to the north. At the **fairs** of Champagne, notaries recorded sales and contracts. In England, notaries existed but did not become as central, and guild clerks kept many contractual records.

Notaries made a living writing legal documents through dictation for people who may not have been literate. They wrote the wills and contracts into notebooks, so they served also as the record-keeping service. Most wills were not recopied. Notaries served as practical lawyers for everyday affairs; they knew what a document needed to include to make it complete and legally enforceable. After 1200, Italian notaries wrote down the place where the document was created (at the dying person's home, for example) and the approximate time of day. When **clocks** proliferated in the 14th and 15th centuries, notaries could write the hour.

Medieval people could expect to die at any time, since death in the form of infectious disease or accident came suddenly. However, most made wills when death could be imminent. This happened when they became sick or were going on a journey. Anyone who went on **pilgrimage** had to make a will first. Wills are a major source of our knowledge about the lives and possessions of people at the time. We can learn a great deal about their family structures and what they owned, since most wills disposed of all the things by name. At the same time, when someone died, the executor of his will often made an inventory of all of his (or her) possessions. These inventory lists are very complete and provide intimate details of the household's goods.

During the **plague** of 1347, notarial records in some Italian towns lapsed. At first, people attempted to call in notaries to make wills, and survivors attempted to have the normal procedure for executing the will enforced. However, so many people died so quickly that, at first, the notaries were overwhelmed with work, and then the process became chaotic. When a family member went to find a notary, the notary had died. When an executor tried to enforce a will, he found that the survivors and witnesses had died. Some people died so quickly that they had no time to attend to legalities, and often whole families died. Burial wishes meant nothing, since the towns were swamped with corpses to bury and resorted to mass graves with minimal rites. The notarial notebooks in towns that tried to keep their legal systems functioning paint a vivid picture of the rapid spread of the plague's chaos.

Notaries recorded other documents, after their primary business of certifying wills. They also recorded dowry and marriage contracts and apprenticeship contracts. Sales and rental of land and houses, and sales and purchases of other commodities like wine, cloth, and wool, were recorded

with notaries. They witnessed the purchase of future crops and rights to use the produce of land (usufruct). They also oversaw the appointment of legal representatives for various reasons, such as guardianship, and witnessed debt and its contracts for interest and repayment. Servants who contracted with a master, merchants who agreed to transport goods, and even singers who agreed to sing in a chapel needed legal agreements. Because so many people needed a notary's services, and because they came in random order to the notary's office, a notary's notebook is a wide-ranging record of the types of people in a town.

Business and Church Records

Even before literacy and **paper** made written records easy, most businesses kept accounts. Italian corporations of the 13th century kept extensive accounting books; their clerks developed the system of double-entry accounting. They had shareholders, currency exchanges, loans, and international sales. When these records have been kept safe, they provide very detailed information about travel and manufacture and can tell some about family life.

Castles and courts kept household records of which craftsmen, merchants, and entertainers they had paid. Although some records have been lost, there were so many castles keeping records of salaries that a great deal of our information about work and the economy has been derived from these account books. The steward in charge of a major **feast** often recorded all the **food** purchased, how many servants and cooks were employed for the event, and how much each **minstrel** was tipped. A lady or queen's household accounts kept track of how much linen and silk thread had been purchased and how many seamstresses had been hired to make a certain winter gown.

The church kept its own records, especially in the late Middle Ages. Early church records are more institutional than personal, such as treatises on divorce or other legal cases. One of the richest veins are penitential guides, books written for local priests to help them give appropriate penances for confessed sin. The books list possible sins in great detail. If a man had sex with an unmarried or a married woman, his penance was a certain amount—but if the woman was his sister or mother, it was greater. The penitential books do not tell how common these sins were, but it rounds out our picture of medieval society to know that someone felt certain sins needed to be listed at all.

Saints' exploits created many records of daily life. Every parish church or **monastery** wanted to record the reported miracles worked by their saint's **relics.** When a visitor, monk, or workman (or even an animal) had an illness or an accident and was cured at the saint's shrine, the event went into

a record book. Taken together, these incidents explain what all these people, **horses,** and dogs were doing during the day and what illness or accidents were most common.

The Cathar Inquisition created volumes of interviews. The inquisitors asked peasants, townsmen, and aristocrats detailed questions about their lives and beliefs. We have a great deal of knowledge of the kinship structures, work, and values of Provençal peasants thanks to the Inquisition.

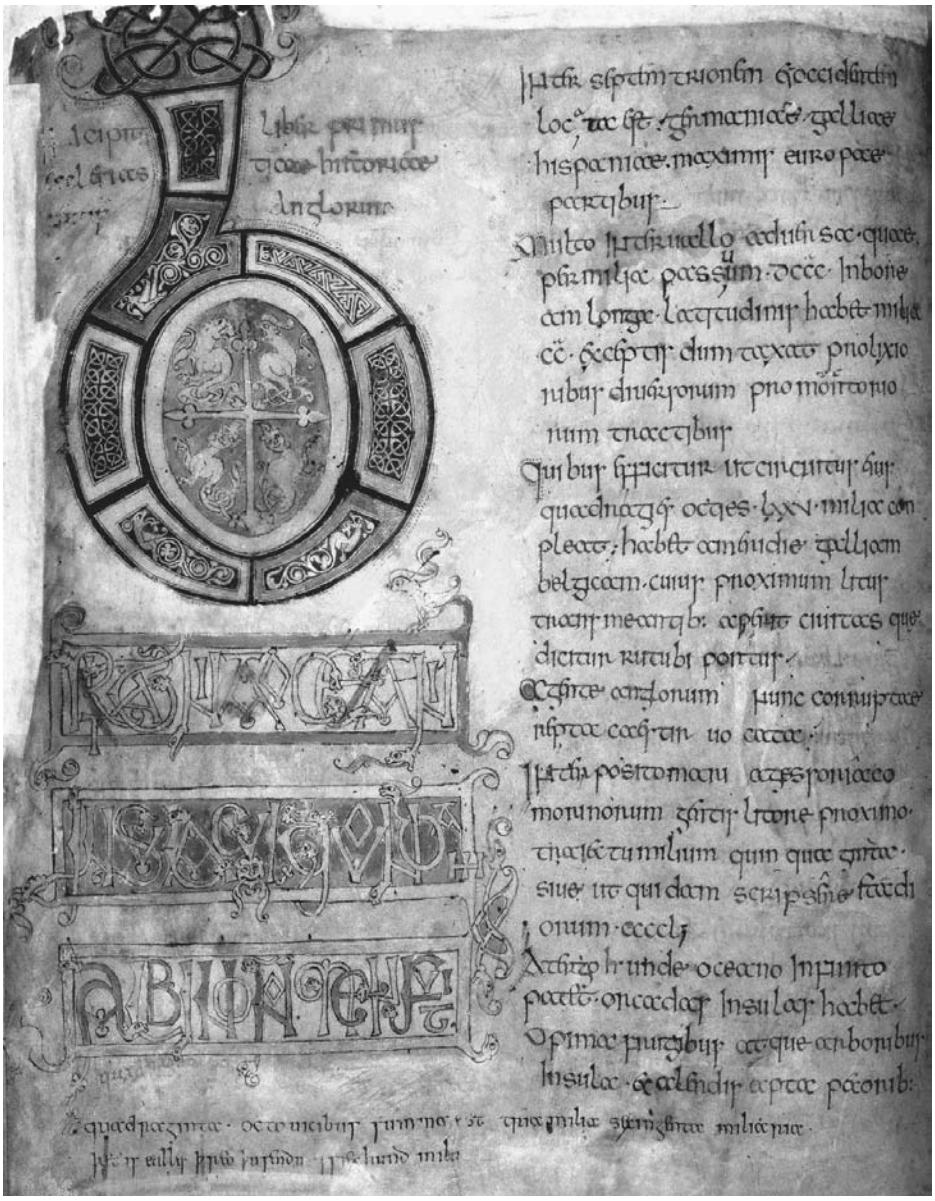
In the late Middle Ages, parishes began to record baptisms. We do not have this information for the early Middle Ages. Baptismal records gave the parents' names, the godparents' names, the infant's christened name, and the date. By comparing baptismal records with other local records, such as court and tax rolls, historians can understand family structure and relationships, as well as infant mortality.

Finally, the church provided an informal record by keeping texts of some sermons. Even in the Middle Ages, a good preacher knew how to tie his message to the listeners' lives. Sermons could include analogies to the lives of animals, stories of people's lives, and warnings against the temptations of the time. When a preacher warns against playing cards, we know that playing cards have been imported and are gaining popularity.

Biographies and Literature

Medieval people sometimes wrote about their lives or others' lives. They wrote family genealogies, which were sometimes accurate and sometimes legendary and amplified by hearsay. A rare early memoir was written by a Frankish lady named Dhuoda, who wrote advice and thoughts for her son around 840. Some of her story is hard to comprehend because she did not write for people of the future, but there is still much to glean about Frankish lives, especially of **women.** The people most likely to write memoirs were abbots and bishops. They were literate, and they sometimes felt they had wisdom to share. The French abbot of Nogent, Guibert, wrote a biography in the 12th century. Guibert was an intelligent man who loved to write; he wrote a history of the First **Crusade,** but his best-known work was his autobiography. He wrote about his early family life, his parents' characters, and the childhood events that shaped him. Margery Kempe, a 15th-century pilgrim, wrote the first real autobiography in English, recording her thoughts and feelings as she pursued her fanatical devotion to the Holy Land and back.

The Middle Ages were a time when great men were admired and imitated. There are contemporary biographies of saints, written by their disciples. Saint Hugh of Lincoln and Saint Peter Damian were among the churchmen who inspired such respect and love that their lives were quickly written. Most, if not all, of the monastic founders became the subjects



The most famous of Bede's eighth-century books is his *History of the English Church and People*. He included the history that he knew firsthand as well as legendary history from a few centuries before. Only four manuscripts of the original Latin text survive into modern times. This page is the cover of the eighth century book preserved in the British Library. (HIP/Art Resource, NY)

of contemporary biographers: Saint Bruno, Saint Francis, Saint Bernard, and Saint Dominic. Church clerks also studied secular great men; a monk named Asser wrote the biography of King Alfred shortly after the king's death. One of the most detailed records of the life and court of King Louis IX (Saint Louis) was written by one of his **knights,** Jean de Joinville. He knew the royal family and recorded private conversations with both king and queen; he kept a journal on the king's two Crusades. Biographies covered not just the saints and kings, but also famous knights and generals like England's William the Marshal. Some monks and priests wrote detailed histories, too, like the Frankish Gregory of Tours and the English Venerable Bede.

Paper mills brought down the price of keeping records. By the 14th and 15th centuries, people below the ranks of bishops and dukes were writing letters. Italian merchants wrote letters to each other, and to those at home, as they traveled. A rich vein of information about medieval England is preserved in the letters of several generations of the Paston family of Norfolk. They wrote to each other as they traveled and as family members settled at a distance. They explained marriage negotiations and child-raising problems, and they expressed personal feelings and opinions. Personal letters are some of the few places where we get the direct voices of medieval women.

Le Menagier de Paris is a work that crosses between personal memoir, letter, and literature. In this large work, sure to be cited in any historical study of medieval life, an aging husband instructed his teenage bride in household arts and behavior. No detail was too trivial for him. He told her how to keep away ants and fleas, how to care for potted plants, how to create a good public reputation, how to roast chicken, and how to buy beef. He wrote directly for her but seems to have considered it a gift to extend beyond his death, so he wrote in a wide scope that would take in all the needs of her lifetime. The book stands as one of the greatest monuments of medieval record keeping.

Other writers created treatises and encyclopedias for publication. By the end of the Middle Ages, there were books on farming, cooking, medicine, animal care, and many crafts. There were advice books for women: how to choose a spouse, how to take care of yourself as a widow, how to raise babies. Knights wrote books on chivalry and how to win at **tournaments;** hunters wrote about the customs of **hunting.** Much more is known about the 14th and 15th centuries from these treatises.

See also: Books, Painting, Parchment and Paper, Weddings.

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Relics

A relic was a physical memorial of a **saint,** a very holy deceased person with special influence in heaven. Relics were most often bones, but they could also be **hair,** teeth, **clothing,** objects the saint had used, or objects the saint touched. They could even be objects that had come into contact with the saint's tomb, near the original relics.

The medieval **church** believed holiness was an ethereal but real substance. This sanctity originated from the saint's soul, but it also remained in the saint's bones, hair, teeth, clothing, and other possessions. Sanctity could be transferred from one relic to another, like magnetism.

The church believed each saint in heaven knew where his or her relics were and wanted to make sure living people were honoring him or her adequately. Since the saint had the power to grant prayer and work miracles, it was wise to honor the saint and gain his or her favor. At least once a year, on the saint's day, the relics were taken out in a procession so everyone could honor them. The relics also came out in times of national distress, such as during an epidemic or a war. In a solemn procession around the church, the bishop or priest walked with banners and reliquaries, while the people walked behind with uncovered heads.

Relics were kept in highly decorated containers called reliquaries. Most reliquaries were shaped like a box or a house. They were made of **gold** or **silver,** where possible, and were covered with decorations. Some were small, but many were very large. One unusual sort of reliquary from the late Middle Ages was shaped like a bust of the saint whose relics it held. Most

were carved from wood and were hollow inside; some portion hinged to open. They were painted to look as lifelike as possible.

Seeing and venerating relics was the main object of medieval **pilgrimages.** Pilgrims wanted to show penance or thank the saint for a prayer granted. They often left images to represent their prayers at the saint's shrine, such as wax ships, wax crutches, wax animals, and wax bodies or individual crippled limbs. Wealthy pilgrims left silver images. Many pilgrims left either **coins** or gifts of other kinds, such as **animals** or other farm produce; these gifts made up much of the income of each shrine. Relics helped finance many **cathedrals.**

Although early Christians had revered the burial places of their patriarchs, such as the Apostle Peter (later Saint Peter of Rome), the fad for relics began with Emperor Constantine's mother, Helena. In 328, she led a pilgrimage of discovery to the Holy Land with the intention of finding all the artifacts and places of the Bible. Helena was willing to believe in anything the locals told her, and she was not at all surprised when she found "the True Cross," still complete and bearing the sign Pontius Pilate had tacked onto it. She also found the Crown of Thorns that Jesus had worn, and she went into the Sinai Peninsula and "found" the mountain where Moses supposedly had received the Ten Commandments. Emperor Constantine built the Church of the Holy Sepulcher over the supposed place of Jesus's tomb in Jerusalem, and Helena placed the True Cross and the Crown of Thorns into it. These relics had to be rescued when **Muslims** overran the city.

The medieval impulse to collect relics was very different from the modern idea of collecting and preserving artifacts. People believed that the relics and anything that touched them had mystical powers, and they wanted to benefit from these powers. If a relic could be divided, it was. It was better to destroy a relic and put its power of sanctity in many places than to keep it whole, as in a museum. If the relic could be embedded in gold or transformed into another shape, they did that, too.

After its rescue from the Muslim invasion, the True Cross was split into pieces, and part of it was encased in gold and jewels and set in a chapel in Jerusalem. Another part went to Emperor Constantine. Its nails were removed; two went into a statue of Constantine on a horse. Other nails were said to be part of the Iron Crown of Lombardy or in as many as 30 churches across Europe. The silk that had wrapped the wood of the cross became a relic on its own and was divided into small pieces for many recipients. The portion of the cross that remained in Jerusalem became a prize for Christians and Muslims to capture and recapture over the years. When it finally came back to the Christians in 1221, it was sold to Venice for a large sum of money. Later, it was pawned for money and, finally, sold to King Louis IX of France, who laid it to rest with his other relics in a church. For years, many churches believed that they owned a splinter of the True Cross.

The Crown of Thorns had a similar treatment. It was kept in a **monastery** in Jerusalem for many years, and it steadily lost thorns, as they were plucked and given to kings or emperors. It went to Constantinople in 1063, and in 1261 it was sold by an emperor desperate for money to King Louis IX for his relics chapel. King Louis IX removed all the thorns as gifts to monasteries and churches around Europe. What remained of the crown went into a reliquary in a chapel of Notre Dame Cathedral.

The most famous relic of the Middle Ages is the Shroud of Turin, whose authenticity has been tested and questioned in modern times. The **cloth,** which bears a strange image of a man lying down, has a mysterious history. It may have been in Edessa, Turkey, in premedieval times, hidden in a box in the city wall. Emperor Justinian built Hagia Sophia Cathedral to house the shroud, and many Byzantine icon paintings of Jesus may be based on the shroud's image. The shroud was carried on devotional tours at times and then was returned to Constantinople. In the 13th century, it disappeared in the chaos of the **Crusades.** The shroud seems to have been purchased by Geoffroy de Charny, a French **knight,** and his family gave it to Louis of Savoy in the 15th century. From that time, it was housed in Turin.

Not only Jesus's burial shroud, but also any other piece of clothing supposedly belonging to Jesus or his mother became a valuable relic. Charlemagne believed he had the swaddling cloths of baby Jesus at the chapel of Aix La Chapelle in Aachen, his capital. Chartres Cathedral in Paris claimed to have the tunic worn by Mary when she gave birth to Jesus. In 911, when Vikings attacked Paris, the bishop displayed the tunic to the attackers

A proper house for a holy relic was most often shaped like a church, the house of God. In order to please the saint, churches ordered reliquaries that were extravagant works of art. The Eltenberg Reliquary, dated to the mid-12th century, is made of copper covered with gold. It is further decorated with enamel and carved ivory. (Ann Ronan Pictures/ StockphotoPro)

to make them abandon their **siege.** The relic later survived a fire that destroyed the old church, which convinced the people that Mary allowed the fire because she wanted a bigger cathedral for her tunic. The magnificent Gothic cathedral of Chartres was the result.

The disciples of Jesus became the source of many valuable relics of the Middle Ages. Christian tradition told what they had done in their lives and where they had died, and, in some places, their bodies may actually have been preserved. In other cases, it is highly unlikely that the bones revered as certain apostles in the Middle Ages were anything but fakes. The most important apostolic relics were those of Peter and James. Peter was buried in Rome, and a church was built over the grave site. The location may be authentic, since his followers began meeting at his grave soon after.

Tradition says that James (the brother of John) preached in Spain; he then returned to Palestine and was beheaded by King Herod. His relics, however, are in Compostela, Spain. A bishop at Compostela verified the bones of the saint, which were discovered along the coast of Spain in 813. It is very unlikely that the bones are really those of the Apostle James, but in the Middle Ages, they were never questioned. Santiago was difficult to reach, situated as it was on the Atlantic coast of Spain. A traveler from England or France had to cross the Pyrenees mountains or go by **ship** to the nearest port; either way, the traveler would be many days hiking through northern Spain, which was rugged. A pilgrimage could take four months, but it was still a very popular journey, and there were other relics shrines along the way where a pilgrim could increase the value of his or her trip.

The evangelists, the men who wrote the Gospels, were also revered saints. Mark's body was in Alexandria, Egypt, where he had died after founding a church. This is plausible, although the bones can't be authenticated. In the ninth century, two merchants from Venice bought the relic and smuggled the body past the Muslim authorities by packing pork products in the top of the box. Luke, another Gospel writer, was claimed by both Venice and Padua. Papal officials examined the bones and determined that Venice's bones were of a young man, so Padua's relics were authorized as authentic.

Early martyrs also left behind relics. Agatha, killed in third-century Rome, was housed in reliquaries at Catalonia, Sicily. Agnes, a young girl, was executed in Rome not long before Constantine declared the Christian religion to be legal. Constantine's daughter built a church over her grave site, and her skull is kept at the Vatican.

Not all saints were ancient, nor were all bodies dismembered. Benedict, the founder of the Western monastic tradition, remains buried at Monte Cassino. Anthony, a Franciscan preacher in Padua, has a revered shrine in Padua. Thomas à Beckett, the archbishop of Canterbury murdered at his cathedral, remains buried in the cathedral.

Other relics were too numerous to keep track of or authenticate. Vials of saints' tears or blood, and hair or bone shards from any number of disciples or martyrs, circulated widely during the Middle Ages. Their authenticity was never questioned. People also made their own relics by carrying cloth to a saint's tomb or collecting stone shards or dust.

Every church or monastery needed to claim it had relics. The monastery at Peterborough, England, believed it had the right arm of Saint Oswald, pieces of Jesus's manger and swaddling cloths, one bone of a child slain by Herod (in the "Slaughter of the Holy Innocents"), pieces of the miraculous five loaves, and relics of six apostles. Most cathedrals and abbeys had similar claims. One had the right arm bone of Mary Magdalene, while another had one of Saint Dunstan's teeth.

Relics began to shape church architecture. Pilgrims did not value relics as much if they were not housed in a grand way. They equated a noble building and gold trim with holiness. As a church obtained more relics, it had to build a larger basilica or cathedral, which it funded with the donations from pilgrims who came to see the relics.

Churches that held the relics had to be careful to protect them from theft or damage. Pilgrims were known to riot if they were not given adequate access. On the other hand, relics had to be stored in stone vaults just to protect them from fire, let alone theft. Where possible, stone vaults were designed to permit pilgrims to come close, but not to touch. Some churches with a large number of pilgrims displayed their relics in reliquaries that hung from a beam across the ceiling. It was high enough that pilgrims could not touch the relics, but they could see them.

Some churches were specially built to cope with crowds of pilgrims who came to see relics. They built crypts, rooms where visitors could sit near the relics. Some crypts, built underground so the relics were positioned beneath the church's altar, amounted to subterranean chapels with their own altars. They were designed with arched vault roofs and pillar supports. Canterbury Cathedral has an extensive crypt of this kind. As pilgrim crowds grew, churches began storing relics in special chapels above ground, encircled by walkways called ambulatories. Pilgrims could walk the ambulatory, which kept crowds orderly and moving. Relics were often in a large reliquary just behind the main altar. The typical Gothic floor plan of a cross was part of this design, since the top of the cross was usually the ambulatory around the relics.

Even with all these precautions, relics were frequently stolen. Although theft was a sin, even priests and monks did not feel guilty for stealing a relic because they believed the saint wanted the relics to be moved, or else he or she would have stopped them. The new owners could claim the old owners had not properly venerated the relics. Theft of a relic proved that the saint had chosen the new resting place.

See also: Cathedrals, Church, Jewelry, Pilgrims, Saints.

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Roads

In the early Middle Ages, well-designed **stone** Roman roads were still very much in use. They were especially dense in Italy itself and in other regions that had been well developed by the Romans. Italy's road system was superior to that of Northern Europe all through the Middle Ages.

In Spain, France, and England, the Roman roads gradually fell into disrepair. Romans only built roads that linked their forts and towns, and Europe outgrew this infrastructure once the period of barbarian attacks ended. The last Roman-style roads were built in northern France around 600. Until very late in the medieval period, road building was not a priority. New **cities** grew where there had never been stone roads.

Roads were rarely built by planning but were developed when they led to a destination: **castle, monastery,** church, market, port, **bridge,** or cemetery. They were named according to where they went or what purpose they served. A road used to transport shipments of **salt** might be called Saltsway.

Medieval roads may be best considered as strips of land where private landowners gave people the right of way to walk and ride. In England, some statutes stipulated that travelers could travel next to a road without being charged with trespassing, if (and only if) the road had fallen into serious disrepair. Landowners had an incentive to keep the roads repaired if they didn't want **horses** and **wagons** to drive onto their land. Road repair in the Middle Ages generally meant leveling out the ruts and putting gravel into swamps or other depressions.

Some roads had been in use since prehistoric times. Some had served early medieval (such as Anglo-Saxon or Frankish) armies. Some were royal roads

By the late Middle Ages, cities had begun to pave roads with cobblestone or brick. Stone paving required men on stools to fit and pound stones into the dirt roadway, kneeling on stools and working inch by inch. It was a slow, expensive undertaking, so at first they paved only the main streets in the biggest cities. Paved streets remained a real mark of distinction until the modern age. (S. Greg Panosian/iStockphoto)

and were maintained to the king's standards: in England, wide enough for two wagons to pass. Wider roads developed along routes for driving cattle, and alternate roads developed in places where travelers wished to avoid tolls. Multiple roads developed on hills, so a traveler could choose which path looked least steep.

Kings and other noblemen traveled frequently as they moved from manor to manor. The English kings of the 13th and 14th centuries traveled almost continually, and they carried baggage in up to 20 wagons. Although the roads must have been difficult, they also must have been passable. We see glimpses into the difficulties of travel in kings' records: shortly before his death, King John's wagons had an unlucky ford crossing, and his crown and other **jewels** were lost.

The paving of town streets in Northern Europe came late in the Middle Ages. Large towns such as Paris and London wanted to improve sanitation and began to build cobbled streets with drains and gutters in the 12th century. It was slow and expensive, as workmen sat in the street on three-legged stools and pounded rocks or **bricks** into the dirt. The result was easier to keep clean, and it shed rainwater into the drains.

Italian towns tended to have more paved roads, perhaps because of their Roman traditions. Rome's streets had been paved since antiquity. In growing commercial towns like Bologna and Milan, many roads were paved with brick or stone. Property owners were responsible for paving the street in front of their buildings, and the city paved main streets and plazas.

See also: Bridges, Cities, Wagons and Carts.

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Roland, Song of

The "Song of Roland" was the most popular epic of its time. Composed by a Frankish **minstrel** named Turoldus, the poem first appeared in written form around 950. Its subject matter was Charlemagne's invasion into **Muslim** Spain in 778. The oral version may have been in circulation for years before it was written, but it was probably not composed close to the time of the events.

In the song, Roland is the Count of Brittany and Charlemagne's nephew. He is guarding the rear of a triumphant departure from Spain, after a military campaign of seven years in which the Christian Franks conquered almost all of Muslim Spain. The narrow pass over the Pyrenees mountains, from Spain into France, forces the huge army to travel slowly, and the baggage train at the back is miles behind. Roland's stepfather Ganelon has conspired with the Saracen ruler Marsile to attack Roland when he is isolated. Roland compounds this disaster by ignoring his friend Oliver's pleas to blow an ivory horn called the "Oliphant," which would summon help. When he finally blows it, help cannot arrive in time, and they are all slaughtered. While this is the most famous incident in the long epic, the story goes on to tell of Charlemagne's vengeance against Marsile, the burial of Roland and his companions, and an enormous battle between Muslims and Christians. The Frankish Christians win, and their Muslim enemies either die or convert.

In the historical events, Roland was a nobleman of Brittany, but he may not have been related to the king; little is known about him. He guarded the baggage in the rear, and the main army went ahead over the narrow

pass of Roncesvalles. Charlemagne's campaign had not been long or victorious; his army had entered at the invitation of some rebellious Muslim rulers in northern Spain who wanted to rebel against the growing power of Abd al-Rahman of Cordoba, who had come to rule about two-thirds of Spain. The rebellion failed, and support melted away. A frustrated Charlemagne heard that the Saxons of Germany were rebelling against Frankish rule and headed back to the Pyrenees to cross into France. The city of Pamplona, home of Christian Basques, closed its gates to him, and his army destroyed it. As the army passed over the Pyrenees, vengeful Basques, and

The "Song of Roland" was the best-seller of its time as both a song and a storybook. This copy was lavishly illustrated, by 11th-century standards. This picture may show the knighting of young Roland. A bishop stands by to bless him as the king gives him a sword. Servants, possibly other knights, attach his spurs. Roland's minor defeat was turned into an epic of victory over the Saracens, medieval Europe's chronic foes. (The British Library/StockphotoPro)

probably some Muslims, attacked Roland and stole the plunder and other baggage the Franks were carrying out of Spain.

See also: Minstrels and Troubadours, Muslims.

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S

Saints

Medieval Christians believed that among the perfect souls who went straight to heaven, some had been so good on earth that they had higher standing in heaven. These included monks who had done notable charitable works and many martyrs who had been killed for their faith. These holy ones, *sancti* in Latin and *saints* in English, could look down on earth and see what people were doing. They could hear prayers and work miracles.

Dead people were certified as saints if they had lived saintly lives, or if they did not smell rotten after their death (this was called "the odor of sanctity"), and if they appeared to work miracles after death. A miracle meant that God had listened to the saint when he or she spoke on behalf of a humble petitioner, and it certified the saint's position of influence in heaven. Medieval people had a low-threshold of definition for a miracle. It could be any improvement within a reasonable time frame, including natural recovery. It did not have to be immediate, and it was still a miracle if the person later became sick again.

During the 10th century, the **church** began to control the process of certifying dead people as saints. During the early years of Christianity, the test had been simple: a martyr's death. After there were fewer martyrs, saintly lives or evidence of miracles at a tomb made people saints. By 1215, the Fourth Lateran Council proclaimed that only the Pope could determine who was a saint. The process was called canonization, and the Papal Court needed evidence of a saintly life and detailed evidence of specific miracles. The petitioner who submitted the saint's name for consideration had to pay the costs of the investigation, so fewer saints were named in the later Middle Ages.

Many medieval people still venerated local, unofficial saints. As the canonizing process became more formal, some of these locally selected saints were called blessed, *beati,* rather than saints, *sancti*. The local people felt strongly about them, but they could not afford the sainthood process or perhaps the saint would not have passed Rome's stricter standards. One local French saint would never have passed the Pope's scrutiny. Saint Guinefort was a dog, killed by his master by mistake while protecting the master's baby son. The canine saint was venerated by the local people, who brought sick **babies** to the dog's grave.

Relics of saints were thought to have special power to work miracles in the saint's name. Most commonly these relics were slivers of bone, often said to be the finger of a saint. One saint's relic was his head, pickled in a jar. Other relics could include scraps of **cloth** they had worn or blessed or items they had used. Shards of a saint's tombstone could also carry the blessing of the saint. Many **monasteries** and churches built their fame around owning relics. The **Crusades** gave wide opportunity for relics real and false (and

often stolen property) to be carried back to Western Europe. They were housed in elaborate boxes called reliquaries.

The foremost saint was Jesus's mother, Mary. During the 12th century, devotion to her as the *Mater Dei* (Mother of God) grew all over Europe. Many people believed Mary had been born without sin, and they revered her as the perfect woman. Many churches and monasteries were dedicated to Mary. Medieval art, both **painting** and **sculpture,** showed Mary with her baby son and with her son crucified. People prayed to Mary in the belief that if Mary asked Jesus to grant their petitions, he could not turn down his mother.

Other saints included the 12 disciples, Roman Christians who had died for their faith, and missionaries like the Anglo-Saxon Boniface. The most famous saint of the Middle Ages was Saint Thomas à Becket, the archbishop of Canterbury who was murdered at the altar of his **cathedral** in 1270. His tomb became a central place of pilgrimage in England.

Many people were named for saints; after the archbishop's murder, thousands of English babies were named Thomas. The **calendar** had saints designated for every day of the year, often more than one. Sometimes people were named for the saint on whose day they were born. Many regions had local saints, and those names were more popular.

Devotion to Mary, the highest saint in the hierarchy, increased during the Middle Ages. Her image in heaven was of a queen in a shining crown, but her image on earth centered on the sorrows she felt as a mother. Tradition said that the body of Jesus was taken from the cross and laid on her lap. A *pieta* was a sculpture of this scene. By the late Middle Ages and into the Renaissance, it was one of the most popular images of Mary. (Allan T. Kohl/Art Images for College Teaching)

People believed saints had particular concerns, based on what they had done while they were on earth. These saints became the patron saints for crafts or places or were called on for certain kinds of help. Sometimes, the link was direct and easy to understand, such as Saint Dunstan as the saint for English goldsmiths, since he had been a metal worker. Other times, the link was more obscure. Saint Barbara's father, who beheaded her, was killed by lightning, so Saint Barbara was the saint who could help with dangerous thunder and lightning, but she was also the patron saint of miners, who used explosives.

Many saints were designated as the helpers for various **medical** problems. Their link with these problems was sometimes connected to their lives and deaths. Saint Clair, who had her eyes put out, was the saint who helped with eye problems and blindness. Saint Agatha's breast was cut off, so she paid particular attention to prayers concerning breast cancer, breast injuries, and breast-feeding. The links with saints and their concerns were not even always known. For whatever reasons, Saint Sebastian helped with **plague,** Saint Osyth with fire, and Saint Oswald with sick **animals.** Saint Margaret was the helper of all midwives and childbirths.

Some saints resided at places, although they were, of course, in heaven. Mary's tunic at Chartres, and other relics of Mary in other places, allowed these places to claim Mary lived with them. Saint Denis had been buried at the abbey named for him in Paris, and Saint Martin's tomb in Tours fixed him there. Saint Anthony of Padua and Saint Francis of Assisi were considered to have lived in their burial locations. When a saint was definitely buried at a place, his favor surely could best be gained by going there to pray.

See also: Church, Medicine, Pilgrims, Relics.

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Salt

Salt occurs in almost every environment on earth, either as seawater or **water** from a salt spring or as rock salt below the earth's surface. Since ancient times, people have known that salt is necessary for human life and for preserving **food.** Water that contains salt is called brine; as water evaporates, the brine becomes saltier. As salinity continues to increase, salt crystals

gradually form and fall to the bottom of shallow water, where they can be raked up. During the Middle Ages, salt was both mined and harvested from salty brine.

In Europe, the premedieval Celts mined and sold large quantities of salt for several centuries. Their Roman conquerors also made large amounts of salt by boiling seawater in **pottery** until a solid block of salt was formed (they smashed the pot to get the salt) and by building shallow ponds along the Mediterranean to let the sun and wind evaporate seawater until salt crystals formed. At the start of the Middle Ages, people in Europe continued to use the many saltworks the Romans had established along the shores of the Mediterranean and Adriatic seas.

Venice became rich as a leading salt exporter, thanks to an important innovation. Instead of using a single pond, salt makers constructed a series of shallow ponds. The first was a large open tank into which seawater flowed. The tank had sluices that kept additional seawater from entering the pond while the sun and wind did the first part of the evaporation. When the brine reached a certain degree of salinity, pumps sent it on into a second pond for further evaporation, and the sluices were opened to allow more seawater into the first pond. When water in the second pond reached a higher level of salinity, the water went to a third pond, and the process was repeated, and so on, until coarse salt crystals formed and could be raked up and dried. Over the course of a year, this method produced a large quantity of salt while requiring very little manpower. The salt produced by this long, slow evaporation process was a coarse salt, very suitable for salting **fish,** which was an important local industry.

The amount of salt a **city** could make and sell was limited only by the space it had available. The Venetian method spread through the Mediterranean during the eighth and ninth centuries. The best salt came from the Bay of Biscay, where the Loire River empties into the ocean. It was called Bay Salt, and it commanded a high price in other parts of Europe.

The shallow pond method worked well in a warm, sunny climate but not in cooler and cloudier northern areas. In early medieval times, the English made salt by boiling brine in shallow **lead** pans laid over a fire—known as the open pan process. The temperature of the brine and the rate of evaporation could be controlled to produce finer or coarser salt for different uses. Salt makers also used the pot process, pouring brine into ceramic or metal pots hung over a fire. A saltwork was called a wich house, a term that persists in English place names. The brine came from lagoons or from the sea itself.

The English also used sand from the seashore. Waves washed over the beach, depositing salt in the sand. In a medieval technique called sleeching, sand was air-dried and put into a pit (a kinch). Water (either sea or fresh) was poured over it until brine flowed out. The process was repeated until

Salt was one of the few necessities of life that was almost always produced some distance away; even common people had to buy salt at times. A salt merchant sold it by weight; he probably measured it into a container that the customer brought from home. The cost per pound was greater for cleaner, purer kinds of salt. (Osterreichische Nationalbibliothek, Vienna, Austria/Alinari/The Bridgeman Art Library)

the brine was salty enough that an egg would float in it. Then it could be used as brine or dried for salt.

Brine springs and brine wells were another source of salt. Springs flowed in areas that had rock salt or in underground streams. To access the brine, brine wells were equipped with machinery to haul bucketfuls up to the

surface. Men (often prisoners) walked treadmill-fashion on a giant slatted wheel, which turned a shaft that wrapped ropes around itself, lifting buckets of brine to the surface. The brine was boiled to make salt.

Rock salt underlies much of central Europe. The ancient Celts dug long sloping tunnels into the mountain, used pickaxes to break up the salt, and hauled it to the surface in leather bags. In the late 700s, rock salt mining started again under the leadership of the Catholic **Church.** In the mid-13th century, removing salt from a mine was made easier when water was piped into the dug-out rock salt; the water quickly became brine and was piped out of the mountain to a village, where it was boiled down. Income from the salt helped support the church and many **monasteries** that were built over brine areas. Salt was shipped via riverboats to other parts of Europe.

Southern Poland has deep deposits of rock salt. In the middle of the 13th century, miners began to dig out the rock salt that had hardened at ancient brine springs. The first miners were prisoners of war who were literally worked to death. In the 14th century, free men began to do the mining. The mines became deep enough that the salt was hauled to the surface by a huge pulley system worked by teams of eight **horses.**

Salt crystallizes in various sizes, depending mostly on the rapidity of the evaporation process: the faster the evaporation, the smaller the crystals. The finest salt is called *fleur de sel,* a light salt that was skimmed off the water's surface during evaporation. The next finest crystals are salt for dairy use (making butter and cheese); then come common salt, a coarser salt for curing ham, and the coarsest grades for salting fish, one of the most important uses for salt. Coarser salt usually had minerals and dirt mixed into it.

See also: Fish and Fishing, Food.

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Schools

While most medieval people did not learn to read, many did—more as the centuries passed. By the end of the Middle Ages, literacy was common, though not yet universal. England's literacy rate may have been higher from the start, since reading and scholarship were prized by some Anglo-Saxon kings, most notably King Alfred. Parents who could read were able to teach children, and many parishes had priests who could read and were willing to teach a few motivated pupils.

The children of country serfs met several obstacles to attending school. In the countryside, it was harder to find a teacher, let alone a school. If they did, they needed the permission of their feudal lords to learn to read; the feudal lord could even be the local abbot, if a **monastery** owned the land. Whether the lord was a **knight** or a clergyman, he often charged the peasant family a fee to let the boy go to school. It may be that this fee purchased the boy's freedom, allowing him to go to town not only to study, but also to stay there and find work.

Large towns had grammar schools for boys. In England, they were more common after about 1200. At first, most schools, whether run by a **cathedral,** monastery, or private master, charged fees. There were both day schools and boarding schools; in towns with day schools, some students who came from a distance boarded with families. These schools primarily taught Latin to prepare boys for careers in the **church** or as clerks. They varied in size; most schools were restricted in size by their charter, either to maintain quality of education or to protect the competition. A grammar school held in a learned man's home usually had no more than 6 pupils, but large town schools could easily have 50 or more.

The Lateran Council of 1215 mandated that bishops must maintain free schools for training future priests. After this, all cathedrals had schools attached, often coordinated with their need for a boys' choir. The cathedral school of Notre Dame in Paris became one of the leading schools of **music** where innovations were tested. Cathedral schools treated their pupils as

This picture decorated the cover of a 13th-century Latin book. It shows a small monastery school of the time. The teacher is seated on a stool, with a stand to hold his book. The students sit on the floor. Some have books, while others must gather around to look on a shared copy. If the students could read along after the teacher, memorizing what was on the page, the teacher believed that they could read it. The mechanics of decoding letters and sounds were not of interest in the Middle Ages. (Erich Lessing/Art Resource, NY)

though they were part of the monastic community; the boys were present at many church services, often singing, and they lived on the monastic schedule. Bishops usually required their pupils to be tonsured like monks, with their hair cut very short and a bald patch shaved on top. The students did not have to take monastic vows, but they were counted as minor clergy and often did become monks.

During the 14th century, some wealthy patrons endowed secular schools that did not charge tuition. A secular school still ran according to religious methods, but it was not formally under the oversight of the bishop. In England, Winchester College was endowed by a wealthy secular canon, William of Wykeham, who later became bishop, but the school was not a cathedral school. It was founded as a school, rather than as a charity or choir of the cathedral. King Henry IV founded Battlefield School in 1409 at the town of Shrewsbury, near where he had won a victory over a rebellious earl. This small college was typical of privately endowed secular schools. It supported a teaching staff of only six, and it included an almshouse to care for the poor, probably including its own poor students.

Next, town governments through Europe began endowing schools, especially in the Netherlands and Germany. Some of these secular schools were entirely tuition free, funded by tax money. By the 15th century, large **cities** like Paris had as many as 50 small schools, mostly for boys, but some were for girls. Towns in Italy were organized as self-governing communes, and, by the 14th century, the town governments ran more schools than the churches did. While most schools remained private and charged fees, some were directly supported by taxes. Higher-level schools were geared for the needs of the Italian commercial empires, emphasizing accounting and document writing.

The word *college* could mean either a preparatory school before **university** or a division within a university. A medieval English college was often a school for boys between the ages of 10 and 17. Students from all different social ranks met at the school to learn, but the school honored their ranks even as children. The sons of noblemen ate at a higher table than the sons of tradesmen, and the poorest charity students served at table and ate with the **servants.** It is likely that the difference in rank did not greatly bother the students; the poor boys were used to hard work, and their status was a kind of work-study program. In some schools, poor students who received full scholarships to study without working had a high status because it marked them as particularly intelligent.

Colleges that boarded a large number of students had to maintain a large staff. Staff positions were the warden and the headmaster at the top, with a team of instructors often known as fellows in medieval England and an usher, whose job it was to mind the door to catch latecomers and to instruct the youngest students. The college also needed support staff,

beginning with a steward and the warden's clerk and descending through the barber, cook, brewer, baker, laundress, valet, and servant boy. The serving staff was, of course, supplemented by the poor students who worked for their tuition. They sang in the choir, served at table, and served the wealthier students in their rooms, and they were not fed as well.

Some students at colleges did not continue to a university; as many as half went into trades. Apprenticeships also seem to have included a fair amount of general business education, such as how to write letters and contracts and how to keep accounts. Some apprenticeship contracts stipulated that the master would send the boy to school for a year or two as part of his training. This was seen in trades that required some knowledge of reading and arithmetic.

The age that most people considered ready for school was seven years old. Before that, boys were considered **babies** and not fully male. For those who were not taught at home, the school day began early, at dawn. Like other medieval workers, teachers had to make use of daylight to save money on lighting. Students were not expected to have breakfasted before they arrived; in some schools, there was a meal break in the morning after the boys had studied for a few hours. Boarding schools served a noon meal, while schools in towns allowed the pupils to go home at noon. The boys returned to school by about two in the afternoon, and the school day continued until about six in the evening. The day was not devoted only to silent reading or class recitations. Teachers also led the boys in prayers, in some cases prayers for the souls of the men who had endowed the school or its individual scholarships in exchange for these prayers.

School facilities were simple; they were not always buildings devoted to the purpose. Sometimes they were rented from a **guild,** church, or tradesman. At the beginning level, they did not use chairs and desks. Students sat on the floor and learned their letters from wooden tablets with handles that resembled ping-pong paddles. Some illustrations show small children standing in front of either their father or their teacher, holding the **alphabet** tablet so the instructor could look over their shoulders and point to the letters as they read. Basic writing at this instructional level was often on wooden tablets or slates that could be rubbed down and reused.

Early reading began with the alphabet and syllables and proceeded directly to the most important text, the prayer book. These prayers were in Latin, and they were merely memorized by the pupils. Those who could continue education beyond this level turned next to the psalter, often learning to sing as well as read. In England, the first stage of real schooling was called "music school." Some young pupils never learned to understand what they were singing but could sing in the church choir. Learning to read in English may have been a lesser activity, a side benefit of learning to read Latin syllables.

The next step was to learn Latin by memorizing words, and then memorizing the ways words could combine. This was "grammar school," and most grammar schools required students to prove basic reading skills for entrance. Grammar schools were more likely to have dedicated classrooms; some were boarding schools with dormitories. Cathedral schools were usually boarding schools. The classrooms that grammar schools used were simple, with benches along the sides, an open area in the center, and a head desk for the teacher. Some had writing desks, but most required students to rest books and writing materials on their laps. Most schools had outdoor privies as **latrines,** but some expected students to use a nearby riverbank.

Students at a grammar school needed to have some basic equipment besides suitable clothing. They had their own **pens,** pen sheaths, penknives, and inkhorns. They had to buy **paper** notebooks, and, at higher levels of instruction, they also bought or rented a few hand-copied **books.** Their school fees also contributed to purchasing firewood, hay for the floors, and candles. Some schools required the students to bring a supply of beeswax candles.

Learning heavily emphasized memorization, so a student who had memorized a prayer was said to "read" it. Students memorized many things, including poems, speeches, and psalms. Older students who aimed at university study or clerical work learned to write at dictation; the teacher read out loud, and the students copied. From the 15th century, we still have paper notebooks students made as they learned Latin. They copied Latin texts, did translations between Latin and English, and composed narratives in Latin. Teachers seem to have used some riddles and rhymes, as well as texts about everyday life, to teach Latin vocabulary and keep the work interesting. Some of the extant notebooks suggest the teachers included vocabulary the boys were interested in learning, including insults.

Mid-level students studied Latin intensively and often "parsed" words. This meant that the teacher pointed out a word in a Latin text, and the student had to state its part of speech and everything else that could be known about the word's form and use. Upper-level students were expected to speak nothing but Latin in the classroom, since at the university, all classes would be conducted in Latin. A mark of having mastered Latin was the ability not only to read and speak it but to write verses in Latin.

The liberal arts, as defined in the Middle Ages, were grammar, dialectic, and rhetoric, and after these, the higher arts of arithmetic, geometry, music, and astronomy. While grammar schools often taught basic arithmetic, they were mostly expected to teach only the first three arts. An upper-level student at a large grammar school could expect to begin to learn

dialectic and rhetoric in Latin. In dialectic, students posed questions to each other and answered them according to basic logical propositions provided by the teacher. Rhetoric was the art of composition and speaking (in Latin, of course).

Medieval treatises on mathematics required students to memorize tables of addition and multiplication. Once students had memorized multiplication tables through 20 times 20, they could learn to solve problems of applied mathematics that they might face in everyday life, having to do with prices, time, and distance. Arithmetic training also taught the use of the abacus. Arabic **numbers** did not become widely used until after the close of the Middle Ages, but especially within Italy's strong commercial tradition, 14th-century students were taught accounting using these much simpler numbers. In Italy, the abacus was the subject most taught after basic reading.

Grammar schools in England often taught French before 1350. French was the native language of the aristocracy for as long as 100 years after the Norman conquest in 1066. As long as the English kings still ruled sections of France, such as Aquitaine, they needed to speak French well, and sometimes they were raised on the Continent. They commonly married French princesses, which refreshed the supply of native French speakers at the English court. Boys who wanted to work in any capacity at court needed to speak French passably well. French teachers could be natives of France or Englishmen who had been taught in French monastery schools. Some later French teachers wrote beginning lesson books, perhaps as an advertisement for their services. But after the Black Death **plague,** teaching French fell off sharply. It became very difficult to find teachers, and all but the highest-class schools gave up.

Masters whipped boys for being late, not paying attention, or making mistakes. They used thin rods of birch and other pliant wood. Most schooling involved a great deal of whipping, although reformers like Saint Anselm wrote educational tracts that recommended kindness.

Schools, both grammar schools and colleges, observed the liturgical **calendar** with its many **holidays,** both **fasts** and **feasts.** English schools appear to have followed a schedule of four terms, modified to three by eventually dropping the summer term. The fall term began at Michaelmas, the winter term after Christmas, and the spring term after Easter. It is likely that boys went home for a few weeks between terms. Christmas included a holiday that was exclusively for the boys at cathedral schools. They elected a boy bishop and enjoyed making parodies of the church's rites and presiding over parties. Schoolboys were usually in school when Lent began and could celebrate Shrove Tuesday their own way. In England, in addition to eating up the meat and dairy, schoolboys held cockfights.

The image of the Virgin Mary as a child, learning to read at her mother's knee, was a popular devotional and domestic scene. Although the Bible story made it clear that Mary was not from a wealthy family, medieval people assumed that her mother, Saint Anne, must have been in the literate upper class. The mother and child were always shown wearing fine clothes and reading from a real book. As was typical in a time of limited seating, the little child Mary must stand while her mother sits. While it tells us nothing about the childhood of the historical Mary, it shows what an aristocratic medieval mother did to teach her daughter to read. Daughters rarely went to school, so learning was handed down within the family. (The British Library/StockphotoPro)

Schools frequently put on plays, especially in England, but also in other European countries. Since the schools were often under the oversight of the church, the plays were usually miracle or mystery plays. The most popular plays illustrated the lives or miracles of saints, particularly the patron saint of the church or town. These plays were often filled with gory martyrdom and could have been genuinely popular with the boys. Choirboys were also part of the liturgical **drama** of Mass on special holidays, acting parts like the **women** visiting the tomb of Jesus on Easter.

Girls did not as commonly learn to read their spoken language and even less commonly learned Latin. Nuns may have taught some girls, singly or in groups. Many convents had small schools for orphans under their care and for upper-class girls who were placed there for schooling or future entrance into the convent. Most English or French girls who learned to read were taught at home by their mothers. It was a mark of higher social class to have a mother who could read; in some medieval illustrations, the Virgin Mary is shown learning her letters with her mother, Anne, who is dressed as a noble lady. By the 15th century, a family of small landowners expected to teach their girls to read and write. The Paston family, whose collection of medieval letters is a resource for scholars, had several generations of women who corresponded in good English. The few women who could read and write in French and Latin were always from noble families. Italy's schools were an exception to this rule. Florence records schools for girls as well as for boys, and there are women teachers on the pay records.

Among **Jews,** there was a strong tradition of fathers teaching their sons to read Hebrew, which was used as a universal correspondence language among Jews in different countries. In a town with a significant number of Jews, the synagogue often sponsored a school. The records of Jewish synagogue schools show that they did not use punishment with young children, but rather gave out sweets as rewards for learning. Older students were subjected to beatings like their Christian peers. Some Jewish students learned Latin as well as Hebrew and the local language.

See also: Alphabet, Babies, Jews, Music, Universities, Women.

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Sculpture

In the Middle Ages, sculpture was the predominant art form. While **painting** appeared in **books** and on some walls, sculpture decorated nearly all public buildings. Like other visual arts, sculpture was seen mostly as a way to use a visible image to lead man to the invisible reality. Most sculpture was employed in making religious art. The next greatest use of sculpture was in making tomb effigies.

Italian sculptors worked most in marble; they often carved Roman pillars into new figures. Until the later Middle Ages, when Italian marble was shipped north, sculptors in Germany, France, and England had to work with their local **stone.** It was usually limestone; the softest form, alabaster, became popular for carving, but in outdoor sculpture it has not held up as well as harder stones. Although stone sculptures are more common, many medieval sculptors worked in wood, bronze, **copper,** and, in the 15th century, terra cotta, a form of **pottery.** Sculpture was often painted; if it was in wood, it was always painted, but even stone sculptures were frequently painted. Wood and stone were also gilded with gold-flecked paint or **gold** leaf.

Many medieval sculptures were destroyed in the Reformation, when they were called idols, rather than art. Painted wooden **saints** were pulled out of wall niches and thrown in bonfires. Some stone sculptures were smashed with hammers. During the French Revolution, even more figures were attacked. Statues of kings and queens, on outside walls and as tomb effigies in crypts, were broken to pieces. During Europe's wars, especially the two World Wars, aerial bombs destroyed more churches and palaces. There are still many unharmed **cathedrals** where the original sculptures are in good condition, and scholars have collected stone fragments in museums and pieced together statues and effigies where possible.

Sculpture was not done for its own sake, as a fine art; it was always made as part of a building. Moreover, the buildings were usually churches, since **castles** could expect to be battered and were kept plain and secure on the outside. Only in the late Middle Ages did secular buildings like town halls start to commission sculptures. Medieval sculpture falls into the same two general periods as architecture, since the two forms were so closely connected. Romanesque churches were called basilicas; they were based on a Roman floor plan and used Roman-style arches. In the 13th century, the style changed to incorporate pointed arches and outer buttresses so that churches could use larger windows and lighter stone supports. The new

style, now called Gothic, permitted sculpture to become both more realistic and more ornate.

Romanesque Style

The Romanesque period of sculpture comprised the early medieval centuries when there were many church reform movements and the active founding of new monastic orders and **monasteries.** As the monasteries became wealthy, they turned to decorating their buildings for the glory of God. Sculpture's first use was in making bas-relief depictions of Bible stories and figures of the saints to decorate columns, capitals, and doorways. The entire front of a Romanesque church could be considered a display board for as many saints, angels, and Bible stories the sculptors could fit onto it. The tympanum, the arched area immediately over the doorway of a church, often displayed the Last Judgment, Christ's ascension into heaven, or some other grand Biblical scene. Some doors of wood or bronze also had scenes carved or cast on them.

Although the idea of a column with a carved capital came from Greece and Rome, the Romanesque sculptor did not always decorate capitals with classical scrolls or leaves. Some capitals had human or **animal** figures carved in bas-relief. They showed Bible stories or scenes of daily life. Some of these scenes were very intricate and complicated, while others were relatively simple.

Woodcarving was an important art form during this time; there were carved doors and altars, but, above all, every monastery and church needed a crucifix. The crucifix was a large cross with the body of Jesus nailed to it. This had to be a true three-dimensional sculpture, not a bas-relief. It was usually carved out of wood, though it could also be cast in bronze or silver.

Romanesque sculptors often signed their work. There are capitals and bas-relief scenes with letters carved into the design, saying "Gofridus made me," or "Simeon of Ragusa made me." Some even included boastful descriptions of the sculptor as well-known or glorious. Although they were carving for the glory of God, the sculptors were proud to sign their names.

Gothic Style

The Gothic period began with Abbot Suger's desire to make the new Abbey of Saint Denis taller with larger stained **glass** windows. New principles of architecture changed the style of buildings and permitted them to be both larger and more heavily decorated. Arches were pointed, not semicircular, and walls were held up by external buttresses. Interior ceilings rose

into higher vaults, now freed from the need to create internal support. Very tall windows were broken into smaller sections with carved stone tracery. The tracery often broke up the expanse into diamonds, roses, circles, and arches.

Gothic cathedrals left few spaces unadorned. Pulpits, which were raised on legs or pedestals so that the preacher could stand high above the congregation, were heavily carved with biblical scenes. Saints stood in every possible niche, inside and outside. Scrolls and geometric designs decorated every edge. Capitals on columns grew ever more elaborate and showed faces, birds, trees, saints, battles, and **cities.**

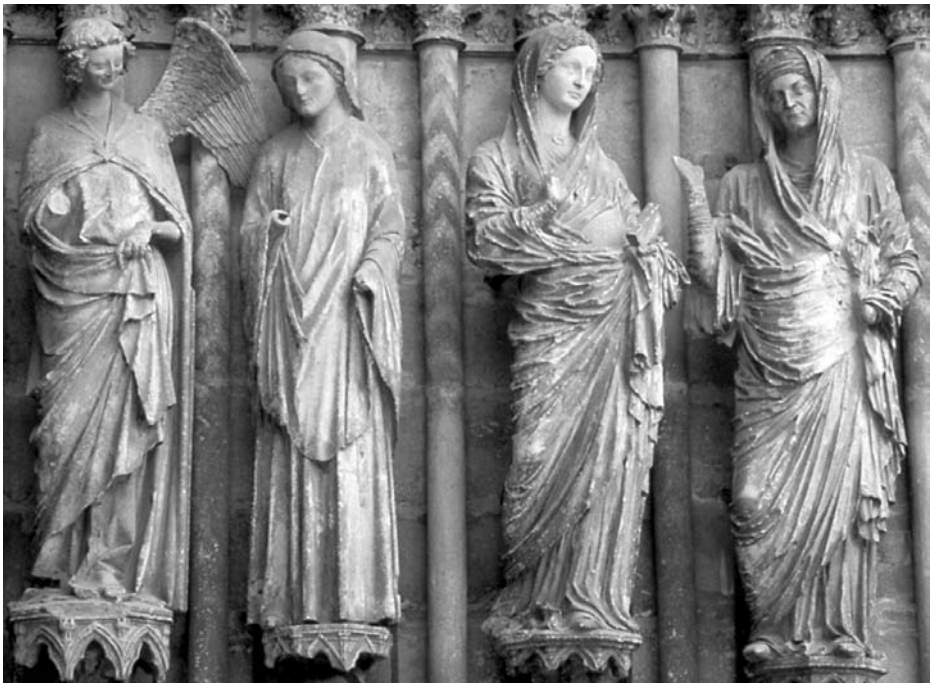
The more widespread use of imported marble permitted fine detail. Gothic sculpture shows greater sophistication than the older style, and figures were emerging from bas-relief into almost freestanding figures. A façade of Reims Cathedral displays figures of Mary with an angel and her friend Elizabeth, and all the figures are nearly freestanding, though still connected at the back. It was carved around 1270, the height of the Gothic.

During the 13th century, the people developed a cult of worship around Mary, the mother of Jesus. There was increased demand for statues showing Mary with the infant Jesus, Mary at the foot of the cross, or Mary in heaven. Mary often wore a large, ornate crown.

From the 14th century on, there was an increasing trend toward secular sculpture. The Black Death **plague** of 1348 was one factor. There was an increased emphasis placed on tombs, public statues, and other memorials. Kings and nobles commissioned more tomb effigies in wood or stone, instead of statues of saints. Lesser nobility and wealthy merchants commissioned brass memorials that were either etched or cast in a mold. Patrons who built chapels wanted their likenesses carved into biblical scenes or just included as memorials of the builder. The church was still important in civic life, but its importance decreased after the plague. Towns decorated not just their churches but also their public buildings. Wealthy cities, particularly in Italy, wanted public fountains and monuments. Italian city fountains, the source of public **water,** were often magnificent pieces of sculpture that symbolized the city's history, industry, and leading families. City monuments showed kings and other heroes on horseback, without any religious meaning.

In the 15th century, visual art became increasingly sophisticated and realistic. Sculptors were memorializing life, not just creating conventional images of heaven. Figures stood in natural poses and had fresh, smiling faces; they were recognizable individuals. They were dressed in flowing robes with highly detailed, natural folds and elaborate decorative bands.

In Italy, some sculptors were working in terra cotta, the ceramic technique of glazing pottery with tin and firing it several times to get a high luster. Lucia della Robbia made "The Visitation," showing the Virgin Mary and



At Reims Cathedral, the figures of the angel Gabriel with Mary and Elizabeth decorate the west facade. Medieval sculptures have often suffered some damage over the years. Particularly in France, some cathedrals were deliberately damaged in the revolution; statue arms and heads were targeted as symbols of the corrupt church. Originally, such figures may have been brightly painted, as wooden statues inside the church were. (Allan T. Kohl/Art Images for College Teaching)

her cousin Elizabeth, in several pieces. The lower and upper body parts were sculpted carefully, fired, and then cemented together and painted. Terra cotta sculpture could be completed much more quickly than marble carving.

Gothic Grotesque

The most famous Gothic sculptures are the gargoyles. The word *gargoyle* comes from French *gargouille,* "gargle." Latin *gargula* means "throat." Gargoyles are decorative spouts on rain gutter systems. In German, they are called water-spitters, *Wasserspeiers,* and in Dutch, *waterspuwer.* The stone supports for the roof had carved water channels, and the rainwater had to be projected out away from the building. A pipe could project out, but masons decorated everything, so they became an occasion for a grotesque, humorous joke.

Most gargoyles depicted winged monkeys, lions, bats, dogs, griffins, dragons, and demons. These creatures appeared to grip the wall with their

A medieval gargoyle on Milan's cathedral was shaped like a small dragon with a duck-like head. Rainwater poured out of its open beak. Every medieval gargoyle is a unique creation of monster, demon, animal, or human. Most of them show an irreverent and vulgar sense of humor that contrasts with the dignity of the same building's carved saints. (Allan T. Kohl/Art Images for College Teaching)

feet and lean out to fling the water several feet away from the wall. Many laugh or grimace or use their hands to pull their mouths open. When they are human figures, there is often some twist, such as a hand on the stomach, vomiting the rainwater, or even the figure turned around so the rainwater comes out of its bottom. Some Italian gargoyles are less grotesque: human figures that pour from pitchers or hold spouting animals.

The grotesque style of sculpting was different from the style on other building elements. Not only did all the figures have wide-open mouths, but they also were carved in an exaggerated way to make them visible from the street. Their features are cut unusually deep to create shadows to outline the features. Their wings, long ears, and claws are big and obvious. It is likely that many gargoyles were originally painted, but they were exposed to the weather and the paint did not last long.

People have long wondered why gargoyles were comic or wicked creatures, instead of abstract flourishes, angels with pitchers, or something

similar that would seem more in keeping with the rest of the cathedral art. Some speculate that the gargoyles represented demons threatening the people below with danger if they fell into temptation or demons pressed into God's service. Some have wondered if the wicked-looking beasts were intended to frighten away evil spirits. There are no medieval writings that discuss them. On the other hand, as the Gothic style became standard on all buildings, gargoyles decorated public buildings made of stone. They can be found on late medieval and Renaissance hotels, mansions, and town halls in Northern Europe. They may not have had an explicitly religious purpose.

In the margins of illuminated manuscripts, artists drew similar grotesque creatures—some were half one animal and half another, some had more than one head, and some had wings. The Bayeux Tapestry, embroidered long before the period of Gothic art, decorated its top and bottom margins with birds, animals, and other figures that do not seem to bear any direction relationship to the story of the Norman conquest. It is possible that the gargoyles represent a medieval tradition similar to modern comic-book art.

The same art style can be seen on some other grotesque decorations that did not serve as rain spouts; some churches and even cloisters are decorated with comic, ugly heads of apes or men. Corbels, wall projections that helped carry the weight above them, often had a grotesque or comic face. Misericords, small projections hidden in the choirs that could support benches to help a priest or monk stand or kneel, showed scenes of daily life or animals and sometimes had grotesque faces or monsters. They were usually carved from wood and were not seen by the public, only by the clergy. It is possible that gargoyles, corbels, and misericords were a chance for sculptors to kick up their heels and have some fun, making whatever struck their fancy. Formal religious sculpture had to be done perfectly, but these informal pieces allowed for artistic freedom.

See also: Cathedrals, Painting, Pottery, Stone and Masons.

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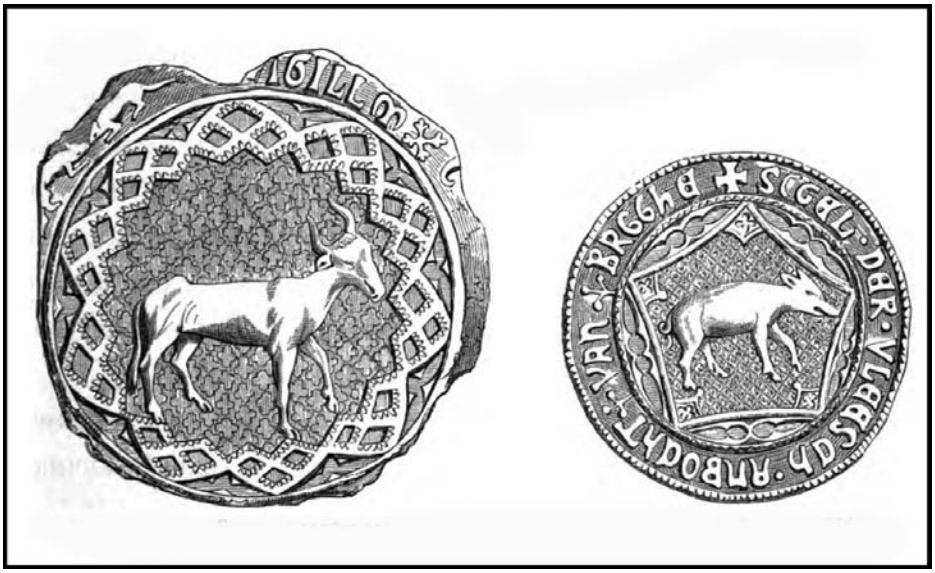
Seals

In ancient times, documents were authenticated by means of a seal that made an impression in clay or wax. The custom of signing a document with an autograph began during the Middle Ages, and by the close of the period, seals were used only in some official capacities, such as customs or government certificates. Through most of the Middle Ages, though, seals were the most common means of authenticating a document, perhaps accompanied by a cross and the person's name. Unlike the crudely stamped **coins** of the time, seals could make a fine, detailed impression. They carried the owner's name and a design similar to a coat of arms. In some cases, the seal needed to have a date on it, so it carried letters around the rim specifying the year of the king's reign.

Although at first only kings had seals, by the 13th century, anyone who wanted to sign a document needed a personal seal. Anyone who entered a contract, bought or leased land, made treaties, or made proclamations had to own a seal. **Monasteries** and bishops had seals, as did companies, **guilds,** and every aristocrat. Kings had personal seals, and their households and departments (exchequer, navy, army, customs) had seals for conducting business. Judges, courts, towns, and counties had seals. When poor people needed to sign a contract but did not own a seal, they had to impress a **key** instead.

Aristocrats' seals had their heraldic arms as well as some personal marking, including their name. Guilds and tradesmen used symbols of their craft, while bishops and monasteries used religious symbols. People who did not have a right to **heraldry** used designs with **animals,** birds, hearts, letters, and mottoes. In a late medieval city, seal makers sold generic (but unique) seals for common people, and they cast seals with a few ready-made design elements that could be engraved with personal details for a particular customer. If a seal was lost, unauthorized parties could use it for forging. The owner had to get a new one made immediately.

Seals were usually made of metal, most often brass or bronze. Royal ones were often **gold,** and common ones used for business were base metals such as pewter. They could also be carved from ivory, jet, or even soapstone. Signet rings were not often used until the 15th century, although King Richard the Lionheart had one. Then, the design could be cut into



By the late Middle Ages, anyone who did business—buying or selling land or entering into other contracts—needed a seal to serve as verification of agreement. Guilds were among the first nonaristocrats to design seals. The butchers' guild of Bruges, like most other guilds, based its seal on its business. With a cow on one side and a hog on the other, an illiterate person could not doubt which guild had sealed a contract. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

the gold ring itself or into a stone such as jasper or onyx. Gems could also be cut as seals, but not set in rings. Gems made very fine aristocratic seals when set in handles of silver or gold.

The carved impression is called the matrix or the die. The seal could be large, with a carved handle, or it could be only a flat disc to hold the matrix. A common handle shape was six-sided, with a decoration at the top, particularly with some kind of ring or loop. Another common shape was round and flat, with a ridge on the back to hold between finger and thumb and a hole for a string or ribbon. A 14th-century design placed the center of the die on a screw in the handle so that it could be used in two levels, either the whole die or just the central design. Some seals had a second die to go at the back of the sealed wax, in which case it had pins to align it to the front die.

The usual way of signing a document, until the late Middle Ages, was to cut a slit in the **parchment** and loop a strip of parchment through it. Some drops of hot wax sealed the parchment strip, and the seal was pressed into the wax. A document with many signatures had many parchment strips hanging off the bottom, each with a little round piece. Each strip could have more than one wax seal, too, depending how long the tag was. Pieces

of cord could also be used, instead of parchment, or the main parchment itself could have a flap hanging down to be sealed. Seals could also be pressed right onto the parchment.

The English kings began using a two-sided seal when they marked documents. The seal was a lump of wax impressed along a strip of parchment on both sides. Each side had a portrait of the king on his throne or in other regalia, but the images were different. Other English seal owners copied this practice; some even used a three-piece seal, in which, after impressing the front and back, the sealer added a tiny bit more wax and a third impression on the back.

Most documents were sealed with beeswax. In the later Middle Ages, resin was added to strengthen the wax, and sometimes even a few hairs were laid into the wax. The wax was usually natural colored, but verdigris green and vermilion red were also used. Colored wax could have been reserved for certain official uses, and some lords could have devised a particular color to be used with their seal. The most famous user of another material was the Pope, who used a sealed lump of **lead** called a bulla to authenticate his proclamations; this led to their modern name, "Papal bulls."

For most documents, the die was pressed onto the wax by hand, but for two-sided seals, they had to use a small rolling pin or a seal press. The seal press was made of oak, with an **iron** screw. Dies used in the seal press had to be flat, without handles. One piece had two or three holes, and the other had pins to fit into the holes to align the dies properly. The dies were placed into the press, and then the strip of parchment was attached to the document and the wax. The iron screw pressed both dies into the wax evenly for a clear impression on both sides.

Seals were also used to close letters and for some other purposes. When people borrowed or lent money, a tally stick was the earliest type of record of the loan, before accounting books came into use. Tally sticks were marked with notches to show the sum of money, and then with a wax seal along the same edge. When the tally stick was split vertically, the notches and seal were both broken, and each party had a matching half.

Customs officials used seals to mark goods after the import tax had been paid on them. They were required to inspect a wide range of goods, from spices and dyes to furs, rice, cotton, olive oil, turpentine, and whalebone. Some goods, such as **cloth,** were certified by attaching a piece of lead with the seal.

See also: Heraldry.

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Servants and Slaves

During the Middle Ages, several new social classes came into being. Although nobles had always kept servants, the new class of free townsmen, mostly craftsmen and merchants, began to keep servants. Every home and business had repetitive, unskilled, heavy work, and where possible this was put out to servants. They cut wood, tended fires, carried **water,** and washed laundry. Skilled maidservants put in long hours helping sew **clothing** and household linens, and, in humbler places or earlier times, they also helped spin thread and weave.

The poorest freemen had no servants, but most people had between one and four. **Records** do not distinguish between servants who helped strictly in the house and those who also helped with businesses attached to the house. In many cases, perhaps most, they helped in both places, for the distinction between work and home was not rigid.

The cheapest servants were children. There are records that in some Italian **cities,** little girls worked as servants with a contractual stipulation that their masters would provide them dowries when they were old enough to marry. The household would have a very inexpensive servant for five or seven years, with a lump sum payment due at the end. There was a gamble involved, because if the girl became unhappy with her place and left before she was old enough to marry, the master did not need to pay the dowry. The girl only got paid if she completed her term.

In England, there were also many child servants, usually at least 10 years old. For some, service in a noble household was a way to make connections and rise into a better station of life than their parents. If a child did well, he would be placed in a good job when he was grown. Children in rural villages eagerly sought positions as servants in cities. It was better to learn a craft, but for those who could not afford an apprenticeship, service was a stable line of work with opportunities to rise by promotion or marriage.

During the early Middle Ages, slavery was a common state of life. Slavery was not racial; it was the result of conquest. When a city was captured, its **women** and children were usually taken or sold as slaves, and its men were also pressed into hard slavery in mines or on **ships,** if they were not killed.

The Catholic **Church** disapproved of slavery and, in particular, banned the use of a fellow Christian as a slave. The economy of Europe did not require foreign slaves, and their use was never firmly established among the

Franks and Anglo-Saxons. The peasants in Northern Europe were often unfree, tied to the land they were born on. They needed permission to leave that land or marry. They were a kind of slave labor, but they were not foreign slaves, and they had a degree of freedom within their bondage to the land. They owed the lord labor, but they also worked for themselves. Most lords did not control their lives beyond demanding the required days of work.

Slave labor was normal both in the Byzantine Empire and in **Muslim** Spain. They owned both African and European Slavic slaves. These slaves served in the house, predominantly women but also men, and they worked in businesses. Some slaves worked in government offices, and some traveled with their merchant masters. Many worked on farms, especially Africans who were used to hot climates.

In medieval Western Europe, the slave trade dwindled, but it was still justified in some places as the sale of unbelievers. The wills of 13th-century Genoa mention slaves a number of times; they appeared to work in the house most of the time but were also owned by artisans who made them do heavy work in manufacturing. The slaves of Genoa probably came mostly from Spain and North Africa. The wills that mention slaves are most often written by people going on pilgrimage who provide for their slaves to be freed if they should die on pilgrimage.

The Italian settlements on the eastern coast of the Adriatic Sea were major slave-trading ports, since they had access to both the inland Slavs and the Mediterranean. They also had to import many basic necessities, which was labor intensive. They could not make a profit if they paid all workers. The word *slave* comes from the ethnic term *Slav,* because from Roman times into the Middle Ages, Yugoslavia and Russia were the main sources of captured laborers. The Slavs were Eastern Orthodox Christians, so they were not really unbelievers.

In Ragusa, the medieval forerunner to the modern city of Dubrovnik, rural Slavic women were trained in households and then sold abroad to other coastal cities such as Venice. These women were taller and stronger than the Italian-ancestry citizens. They could do manual labor of all kinds, from helping process exports to cooking and cleaning. Some were nursemaids, and they were often freed upon the death of their masters. They may have looked like servants, but they were not paid, and if they ran away, they could be captured for a reward. Slavic men were not favored as household slaves because they were so much taller than the citizens, and they could create an uprising. Many of the slave women bore children for their masters but were not permitted to marry. The children remained slaves, in most cases.

The slave trade in Ragusa came to an end in the 13th century because slave prices ran so high that they began using indentured servants instead. A Slav's labor for a set number of years was purchased with an initial payment

Servants were the great invisible presence in medieval history. They are rarely mentioned in histories, although they have a place in court records. For the most part, they were a vast middle layer of society that owned little but kept everything moving. As in this image from the Luttrell family psalter, large numbers of servants kept all kitchen preparation going. (The British Library/StockphotoPro)

to the parents, with a final payment to come when the time was up. Although these people lived like slaves, they received training on the job and sometimes became skilled artisans, and they could not be sold abroad. They could expect to be freed after 5 or 10 years, and the owner was saved the expense of keeping them into old age.

In the 15th century, the Portuguese and Genoese began trading in West Africa. Portuguese settlers founded **sugar** plantations on islands in the Atlantic Ocean, such as Madeira and Cape Verde. By the close of the medieval period, black slaves were working in the labor-intensive sugar process. Sugar was a highly profitable trade in Europe; a block of sugar was worth as much as a block of silver. By 1500, the Atlantic island plantations exported enough sugar to bring the price to less than half of its previous levels, and the connection between sugar and African slavery was well established.

See also: Cities, Spices and Sugar, Weddings.

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Ships and Boats

Ships and boats were both crucial to travel in medieval Europe, since there were no good methods of land travel. As cities grew all along the coast, so did the need for ships that could transport large quantities of goods. When the Middle Ages opened, Mediterranean boats were built like the Greek and Roman galleys and cargo ships of earlier years. By the end of the Middle Ages, men had developed true ships, three-masted vessels fully equipped with billowing sails, in which they explored the coasts of Africa, India, and Central and South America. The development of boats and ships in the Middle Ages followed different paths in Northern and in Southern Europe because of differences in **climate,** natural resources, and the nature of the waters where the boats were used.

The Mediterranean is a very deep sea; it is more than a mile at its deepest. It has a very narrow passage out to the Atlantic, so there is virtually no tide. However, navigating the Straits of Gibraltar, only eight miles wide, is very difficult, so Mediterranean vessels needed good maneuverability. The galley and carrack were developed under these conditions. By contrast, the Norse and the Franks sailed the Baltic Sea, the rivers of Germany, the Barents Sea, the North Sea, and the North Atlantic. Most of these waters are relatively shallow along the coastlines; the Baltic itself is only about 1,000 feet in depth at its deepest. The North Atlantic waters are subject to violent winds and storms. Viking longships were well suited for maneuvering shallow rivers and coastlines and narrow, rocky fjords; Baltic cogs were wide and sturdy in storms.

Boats

Inland rivers were the highways of early medieval times, when **roads** were too poor for dependable travel. Many villages and towns were situated along streams that flowed into the larger rivers. In the Mediterranean region, there was a long, unbroken boat-building tradition that continued

into the Middle Ages. Their **fishing** boats were like the open wooden plank boats of Roman times. In Northern Europe, however, there were not long traditions of boats, and at first they were very primitive.

The simplest kind of boat was a dugout canoe made from a large log; they were more common in the north, where there were forests of tall trees. These boats were among the most common riverboats for individuals and families, and they remained in use all through the medieval period. They were between 6 and 12 feet long and were carved to be wide and shallow. They sat low in the water but were very stable; they were often propelled by a pole. Large dugouts may have had a small sail.

The other primitive northern boat was the currach (or curragh), made from animal hides that were sewed together and then stretched over a wooden frame. To make a watertight surface, the strips of hide were overlapped along the sides of the boat. This method of overlapping layers of hide or planking on the side of a boat is called lapstrake construction. The currach had a planked floor and was propelled with oars; it was usable in rivers and along the coast. Currachs are still in use today in some remote areas of the British Isles. By the seventh or eighth century, there was a larger version of the currach, still constructed with overlapping pieces of hide but big enough to have four oars on each side and a steering oar in the back. These boats were sturdy cargo carriers capable of carrying a few cattle or a small flock of sheep.

Fishing boats in estuaries and along the seacoast needed to be larger and deeper, although some dugout boats may have ventured on the waves. The standard fishing boat of Northern Europe used lapstrake construction with curved wooden planks to build the craft up from its keel. In larger form, the same methods made seagoing vessels, but they were shallow and small for rivers. Most of them were rowed with a pair of oars, and some had a single sail. They were open and were usually filled with cargo or fishing nets. Their construction was not much different from the traditional Mediterranean fishing boats.

As shipping increased along the rivers, there were barges for goods and ferries for passengers. Barges and ferries were usually wider and flatter than other boats. Some were rectangular, rather than pointed at the prow. On small rivers, the ferry at a crossing was often attached to a rope that went from bank to bank, so the ferryman and the passengers could pull themselves across and not drift downstream.

In towns along the rivers, the shores and beaches were at first good enough for docking the early shallow boats. As boats grew larger, and as seagoing ships came up rivers to the city ports, a better system was needed. The earliest wharves seem to have been causeways of dirt built out into the water, shored up with wooden planks. The wharf jutted into the water with spaces between for the boats to tie up and unload. A harbor with

wharves also allowed royal officials to inspect, regulate, and tax incoming wares. Every century, the wharves grew farther out into the water. Customs houses, shops, and warehouses were always built on the wharves until they were too crowded, and new wharves were built. In a large town, the riverbanks were no longer sloped, but walled.

Baltic and North Atlantic Ships

The classic Viking boat, the longship, was built by the same basic method as the currach but with long overlapping oak planks instead of hides. Using an iron ax or adze, the builders split tree trunks into long planks and shaped them to construct the hull. They laid a flat keel plank, added a garboard plank on each side of the keel, and then began building upward. The lapstrake planking that ran the length of these long boats was made of shorter planks notched at the ends (scarphed) and joined to make the required length. The planks were overlapped, sewn, or lashed together and then fastened with iron nails.

The interior framework was put in place only after the hull was built. This included the ribs and, in later years, wooden braces to stiffen the hull and allow the addition of a mast step to support a mast. A boat built this way is called clinker-built because the nails were clinched. Clinching or clinking a nail means using a hammer to bend the head of the nail against the wood, or against a small metal ring or plate (a rove), to hold better. Oakum caulking, which is woolen twine soaked in tar, was tucked into the cracks and edges. The steering oar of these boats was customarily hung on the right-hand side of the boat, the steerboard side. Loading was done on the left side of the boat, the ladeboard side. (This is the source of the terms *starboard* and *larboard* for the right and left sides of a boat.)

Norse ships in general were comparatively light; the oarsmen could move the boat along at a speed of three knots an hour (about 3½ miles per hour). Under sail, a Norse ship moved rapidly before the wind. The flexibility of a clinker-built hull made it possible to sail the boat in the open ocean, as the hull flexed with the waves.

Some key archeological finds have permitted archeologists to examine longships first hand and trace their development. Illustrations such as the Bayeux Tapestry are rarely accurate as to size, so it is difficult to know how large these ships were without firsthand examination. Three longships were preserved in the acidic bogs of Denmark, and five more were discovered under water, having been sunk deliberately to form an undersea wall. Some have been recovered from graves. Archeologists have dated these ships using dendrochronology, the analysis of tree rings in the wood.

The oldest ships, found in a Danish bog, had flat bottoms so that they could be easily drawn up on a beach. These ships dated back to Roman

times. Only one had a real keel, and none showed evidence of a mast for a sail. One had rowlocks for oars lashed to the gunwale (the upper rim of the boat's body). They were steered with oars.

The ship burial at Sutton Hoo, in southeastern England, preserved a longship in a different way by building a wooden roof and earth mound over it. The Sutton Hoo boat was built during the sixth century and buried around 625. By the time it was discovered under its tumulus, the wood had rotted away, but the planks left clear impressions in the sandy soil, with some remnants of the iron nails. The ship was almost 90 feet long; the hull was about 4½ feet deep, and the keel was three inches deep. Each side was made of nine narrow strakes (planks), one inch thick and joined end to end by scarphing. The ship was propelled by 28 oarsmen and a sail. There were no benches; oarsmen in these boats probably sat on the sea chests that held their belongings.

The Oseberg ship is one of the few medieval vessels preserved intact. Most of what we know about the ways these ships were made and how they handled sailing conditions comes from careful study of the Oseberg ships and a few like it. One of the structural surprises was how close to the water the gunwale rode, compared to the high, curved prow. The design has proven surprisingly practical and stable in stormy conditions. (Werner Forman Archive/StockphotoPro)

By 700, nearing the heart of the Viking Age, some new building techniques had made the ships even stronger. Boats that were built for use in Norway's fjords and in the narrow and stormy sea between Norway and Denmark were made bigger and stronger, with their hulls braced so the ships could carry a mast and rigging. They had deeper hulls and massive keels for better stability in rough seas. Boatbuilders also developed vessels for different purposes, including cargo ships, fishing boats, and warships. Several of these types of boats were found in Denmark, in a narrow fjord at Skuldelev, where five vessels had been intentionally sunk in about 1050 to make a barrier against invasion by the Norse. The warship was the largest known Norse boat, at 118 feet long. It was probably built around 1030, and it could carry 100 men.

Another warship was a type called a drakkar; it was the classic Viking ship, able to carry 80 men. Drakkars were the pride of their owners, who adorned them with carvings of dragon heads, snakes, and birds of prey. The Skuldelev drakkar was built of wood from Ireland; the tree rings indicate the wood was cut in 1042. Dublin was a Norse settlement at the time, and the ship may have been built there. William of Normandy used drakkars to conquer England in 1066, as shown on the Bayeux Tapestry. The Vikings also preyed on cargo ships and were dreaded as raiders and pirates, especially in the Baltic.

The other three boats were not warships. One was an ocean-going knarr. It had decks fore and aft, with an open hold for cargo amidships. It could carry a crew of five to eight and a cargo of around 24 tons. The square sail would have been made from about 100 square yards of woven homespun strengthened with criss-crossed strips of leather. A knarr was more rounded than other Viking ships, with a deeper hull for cargo. It was mostly sail propelled, with just a few oarsmen to adjust the direction during tacking. Knarrs were very similar to another sort of fishing boat, the ferja, which also have been found sunken. It had an extra plank around the sides to make it deeper to carry more fish. There was also a small trading boat, a byrding. The deck was planked at the front and at the back, with an open hold for cargo. This boat moved along the coasts, carrying people and goods.

The cargo ship most widely used on the Baltic was the cog, termed a "round ship" because its width was fully half its length. Authorities disagree about the origins of the cog, some believing it to be a development of the longship but longer, heavier, and wider of beam to support sails. Others hold that the cog's ancestor was the logboat of the Frankish people who lived in that area during Roman times. A cog was found as wreckage in a river near Bremen, and it confirms that the pictures on the **seals** of some of the cities in the Hanseatic League were correct. The early cog was a round ship with a flat bottom and a single mast that carried a square sail. The cog curved up at the ends and was equipped with a broad right-side steering oar.

Shortly before 800, the emperor Charlemagne chose the cog as the best ship to ward off the Viking piracy that continually preyed on the rich ports and monasteries along the Baltic coast. He ordered a whole fleet to be built and also brought an army by land, an army that built **bridges** as they came to cross some of the rivers that were the inland transportation system under Charlemagne.

By around 1200, the cog had been further developed for carrying large amounts of cargo. It was the workhorse ship for cities of the Hanseatic League, a cooperative trading league organized in 1159 to facilitate the shipping of goods in Northern Europe and to ward off the constant Viking piracy. Eventually there were 84 cities in the Hanse, with Lübeck as its headquarters. Boats traveled the Baltic and North seas and the Atlantic Ocean and also worked inland on the Rhine River. Some voyaged southward to trade with people along the English Channel and even with cities along the Mediterranean.

The cog's height indirectly brought about a major design advance: a steering rudder hung on its straight vertical sternpost. It was a welcome change from the use of the steering oar; steering from up on the deck had become more and more difficult as boats got taller. Height also gave it an advantage over the Viking pirates, whose longships sat very low in the water. The Vikings' answering move was to add open wooden structures called "fighting castles" to the front and back of their longships to provide temporary platforms for archers and for hand-to-hand battle. Quickly, fighting castles were added to the cogs. Forecastles and sterncastles became standard parts of ships, though their use changed over the years. The right-side steering oar had to be much longer and was therefore harder to use.

Several other improvements in the cog were using the yard arm of the mast as an early crane for hoisting cargo in and out, adding bulwarks to protect the working area of the deck, using shingles on the sterncastle to enclose the tiller and provide a sheltered place, and adding hatches and a windlass. The cog also became larger; by the middle of the 13th century, some carried as much as 240 tons. Around 1400, some cogs became warships, armed escorts for valuable cargo. During the Hundred Years' War between England and France, cogs served as military transport or armed escort ships.

Two other northern ships deserve mention. One is the hulk, which was developed in England, probably in the late 13th century, as a hulk is pictured on the 1295 town seal of Hulksmouth. It displaced the cog as the main ship of the Hanseatic League. A Danzig town seal shows it as a large cargo carrier, flat-bottomed and equipped with a single mast and fore, stern, and top castles. The hulk could be towed on inland rivers. Its sterncastles and forecastles were actually part of the boat, not added-on platforms. The earliest known hulk dates from the late 700s. By around 1450, the hulk

had largely replaced the cog. The other form of northern ship is the nef, a transitional form of the longship, the first northern hull with differences between the bow and the stern. The bow was more rounded than the stern, and the boat was fitted with a second mast (mizzen mast) that carried a triangular lateen steering sail to help keep the boat on course.

Mediterranean Ships

The Romans had used two basic kinds of ship. Galleys were their warships, and they used cargo ships known as round ships. During the Middle Ages, both types were adopted and improved on century by century. Early Byzantine dominance was challenged by new **Muslim** navies in the seventh century. Although the Arabs had been sailing the Indian Ocean in Indian-style ships, their Mediterranean fleets were in the same style as the Roman and Byzantine ships, since they bought surplus ships and hired local crews.

Roman warships were galleys that moved by means of both sail power and the muscle power of dozens of men at the oars. The basic Roman galley had been developed into larger versions—the bireme and the trireme—that used two or three levels of oarsmen, with several men on each oar. An even-larger galley had used five levels of oarsmen. Throughout the Middle Ages and even into the 18th century, Mediterranean warships continued to be galleys, most of them using both oars and sails.

One important development formed the principal warship of the Byzantine Empire—a dromon. There were three variations of the dromon. The smallest, the ousiakon, carried a company of 100 men (an *ousia*). It was a two-banked galley. The men on the lower bank only rowed; the men on the upper bank rowed but were also the fighters in battles with other ships. The pamphylos was a little larger; it carried a crew of more nearly 150. The true dromon carried a crew of about 200, with 150 oarsmen on two banks of oars and 50 marines (fighting men). These larger dromons had a raised tower near the mast, where the marines could stand to shoot arrows or throw spears or other projectiles. Most dromons also carried either a powerful catapult, which could throw a 20- or 25-pound object more than 250 feet, or a pressurized siphon flamethrower that propelled liquid Greek fire onto the enemy ship's deck. Greek fire was an incendiary substance that continued to burn even when it hit water.

Venice created its own version of the dromon while it was under Byzantine rule. It was called the *galeagrossa,* and it was put to both commercial and military use. In the Mediterranean, the two purposes ran together. Merchant ships needed defense, and navies had to carry cargo. Sailors learned to fight. Venice's Arsenal built galleys that eventually challenged the cogs' dominance in bringing Flanders wool to the Mediterranean.

Mediterranean ships, beginning with Greek fishing boats and including the massive dromon, developed a new type of sail during the Byzantine era. Roman sails had been square, but square sails moved a ship only in the direction the wind was blowing; adjustments allowed some variation but not much. Lateen sails were triangular, not square. They were hung from a yard (crossbar) that was fixed partway up the mast at a slant. A long, narrow triangle of sailcloth hung down almost to the deck. This shape creates a baggy lower part of the sail that traps the wind and funnels it up to the narrow top, creating a substantial amount of lift when a ship is sailing with the wind. It could be angled to let a ship steer a course that was not directly with the wind or almost against the wind. By the ninth century, the ships of the Mediterranean were generally lateen rigged and capable of working their way windward. The triangular sails were huge, and the yards they were fastened to were made of large tree trunks. The square sail eventually made a comeback around the 1300s, partly because of the amount of manpower needed to swing lateen rigging around. The square sail caught more wind and enabled the ship to move faster.

Mediterranean ships were not only different in having galleys of oars and lateen sails; they were constructed in a completely different manner from Baltic and North Atlantic ships. Viking ships and the cogs of northern waters were clinker-built: outer shell first, with overlapped strakes, and then construction of the inner framework. The method of construction in southern waters was just the opposite. They built the framework first, with beams and ribs, and then covered the framework with planking. Boats built this way are called carvel-built. Three medieval shipwrecks show advances in construction methods over several centuries.

A carvel-built hull from the seventh century found in the eastern Mediterranean, off the coast of Turkey, shows the basic construction method. The builders laid the keel first, then added high, curved endposts. They fastened planks alongside the keel, joined by mortise and tenon and pinned by trenails (wooden pegs that swell when wet to tighten the construction). They added planking up to the waterline, nailed to a framework, and set crossbeams from side to side to bind the hull together. These crossbeams protruded through the hull. At the stern, the crossbeams were a good place to hang a steering rudder on each side of the hull. In the middle of the ship, crossbeams helped support the mast. This particular ship was about 67 feet long and could carry more than 65 tons of cargo. When it sank, it was carrying 900 containers (amphorae) of wine. It also carried 11 anchors.

Another wreck along Turkey was dated by coins to the 11th century. The cargo was mostly glassware, and this ship also carried a large number of anchors. The carvel construction was more advanced by the 11th century. The framework was laid out, then curved timber ribs were added and planking was nailed on with iron spikes. The alternating of the scarphed

joints contributed to the strength of the hull, as there was no continuous line of joints across the ship. A third wreck from the estuary of the Po River was dated to about 1300 and was 65 feet long. A new method made the ship strong enough to hold two masts. They used frames attached to floors that crossed the keel and were then secured to a timber bolted to the keel for extra strength.

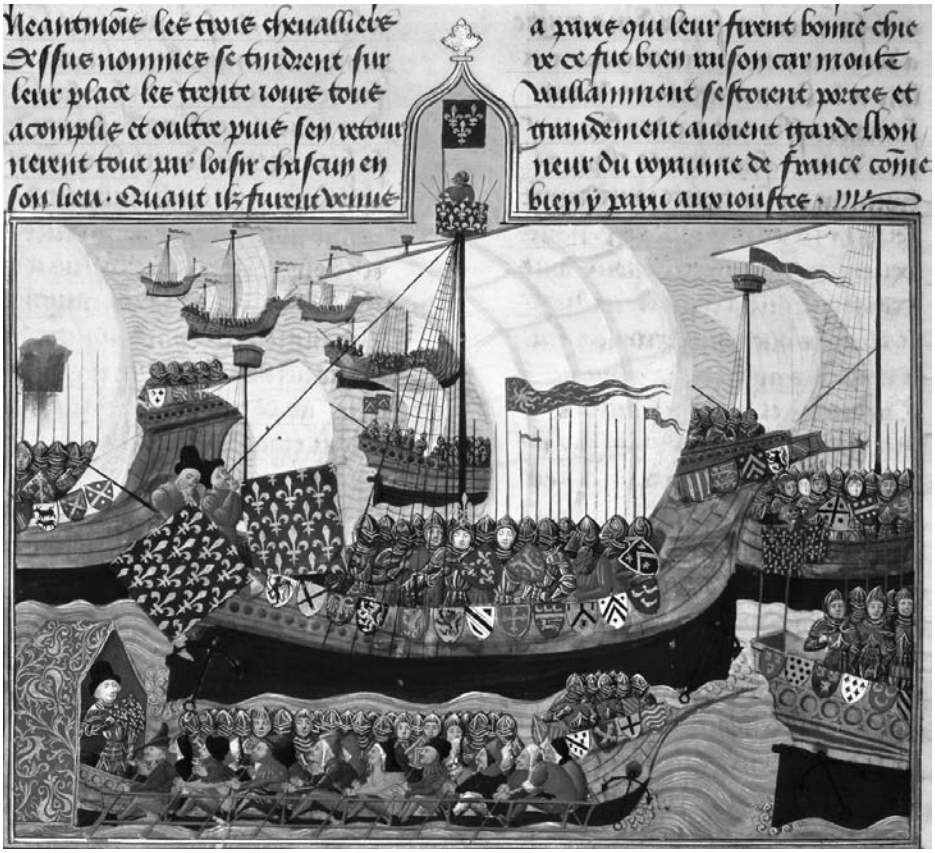
In the years after 1000, the role of the ship changed dramatically. Commerce was increasing, merchants were becoming wealthy, and ships were increased in size to hold more cargo. After Crusaders set up a Christian kingdom in Jerusalem, there was a great surge of Christian **pilgrims** wanting to visit Jerusalem. All these factors created demand for larger ships.

The **Crusades** spurred a great deal of shipbuilding to transport **knights** and **horses** from Marseille or Venice to the Holy Land. At first, Crusaders rented any ships they could find, but by the Third Crusade of the 13th century, more were required. King Louis IX of France contracted with merchants in Genoa, Venice, and Marseille to provide custom-built ships for his two Crusades, in 1248 to 1254. These were substantial vessels, several with three decks. The horses were led into the ship through a door that was then caulked shut to keep water out when the ship went out to sea.

In the 15th century, the Baltic and Mediterranean traditions began to mix. The Hanseatic League had extended its reach into ports in the Mediterranean, and Venetian galleys were trading directly in Flanders. One early hybrid was the buss, a wide, carvel-built cargo fishing ship built in the Netherlands. Using the buss, Dutch sailors could stay out at sea longer. The buss sailed with the fishing boat; it was a floating fish-processing plant. The pair of vessels could stay out for several weeks and return with its catch salted while fresh.

The ultimate round ship of the late Middle Ages was the three-masted, full-rigged, ocean-going carrack. The carrack's precursor was the cog, the clinker-built cargo carrier of the Hanseatic League. In Mediterranean shipyards, the cog had been modified and refined; it was no longer clinker-built but was now carvel-built. Its sails also blended the best of north and south.

The carrack was large and heavy. Huge ribs formed the hull and supported multiple decks, a high sterncastle, and an even higher (though smaller) forecastle. The ship's tiller passed through a port to move the sternpost rudder. The edge-to-edge planking of the ship was caulked with oakum and tar or pitch to help keep seawater out. For the same reason, the ship was constructed with few hatches and no companionway (a stairway leading from the deck to the cabins below). Its three masts were the main mast and foremast, both square rigged, and the lateen-rigged mizzenmast, which rose from the sterncastle. Later versions of the carrack included another small sail—the spritsail on the bowsprit. Improvement in managing



Ships were integral to the Crusades. Most Crusaders gathered on the coast of southern France and embarked at Marseilles. Since their warfare was dependent on horses and they could not easily buy or train them on the other side of the journey, they had to get ships with stables built below the deck. Travel was uncomfortable; knights traveled with retinues of servants and squires, and the ship was too crowded to afford sleeping quarters for all of them. Although this 15th-century painting imagines the voyages in a cheerful way, the actual conditions must have been squalid. Horses needed some rest periods on islands in order to regain their health. (The British Library/StockphotoPro)

the ropes made the huge sails easier to handle, and multiple sails gave versatility to managing the course of the ship.

A large merchant carrack could carry 1,000 tons of cargo in its hold as it moved around the whole length of the Mediterranean and to and from the Baltic. Its great size made it an expensive ship, and it was expensive too in that it required a large crew. There were smaller carracks, too, such as the 100-ton *Santa Maria,* the ship that carried Christopher Columbus to the islands of Central America.

Columbus's other ships, the *Niña* and the *Pinta,* were caravels, not carracks. The caravel was a fast sailing ship developed in Portugal around 1440. It carried two or three masts, with either lateen sails or a mixture of square and lateen. The caravel had excellent sailing characteristics and did not need the large crew that was necessary on a carrack. It could move at a relatively fast pace; records show that on the return trip from America in 1493, the *Niña* and *Pinta* had at least one day when they covered nearly 200 miles of ocean. Caravels were generally the ships of choice for the voyages of exploration that marked the end of the 15th century and continued into the 16th century.

War at Sea

Ships were at times used for direct warfare, not just for military transport. Naval warfare was most important in the Mediterranean; both Muslim and Christian kingdoms kept naval fleets of galleys. Northern Europe's foray into naval warfare was delayed, although merchant vessels began carrying crossbows to defend against piracy. Piracy was the first reason to create military vessels to support merchant shipping, more than foreign warfare.

In the Mediterranean Sea, Egypt, Constantinople, Venice, Genoa, and other regional powers maintained galley fleets with both rowing benches and a lateen sail. The galleys were armed with a platform that ran the length of the vessel—so that men could pass easily from end to end—and with freestanding pavises (shields) and crossbows. Some had a forecastle, perhaps armed with small catapult **weapons.**

A naval battle typically began with distance shooting. Crossbows were increasingly the largest part of naval battles. As the ships rowed closer, each crew would try to board and master the other. Ships usually had a boarding platform of some kind, something that stuck out and could be touched to the other ship. They also threw grappling hooks out, attached to iron chains. Poleaxes could reach out to cut the enemy's rigging. Some crews threw soap on the other ship's decks to make fighters slip. Others threw lime at the enemy to blind them. Most devastating, those who had access to its formula flung Greek fire, catching the enemy's ship on fire. Nothing but ammonia, in the form of stale urine, could douse Greek fire. There was a great deal of hand combat, although crews were lightly armed. Plate **armor** had no place at sea, but hardened leather or light chainmail could help in close combat.

During the 14th century, the countries of the North Atlantic built up their stock of fighting ships. France and England both acquired some galleys. During the Hundred Years' War, French galleys harassed English shipping and attacked English ports and English-owned ports in France, such as Bordeaux. English galleys, often hired as Spanish or Italian mercenaries,

tried to defend shipping. Germany's Hanseatic League was often armed, and there was an order of oceangoing Crusaders in Germany to protect shipping against infidel attacks.

See also: Fish and Fishing, Sieges, Weapons.

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Shoes

By the Roman era, shoe making had the basic elements we recognize: soles and uppers that tied or buckled around the foot. In places with greater traditions of craftsmanship and more wealth, shoes were made by professional shoemakers using lasts—carved wooden models of feet. Medieval shoemakers worked within an unbroken tradition from Roman times.

As with other aspects of European culture, the Roman traditions were best retained in the Mediterranean region, while the Franks and other northern peoples began with their own methods, usually more primitive,

and gradually adapted to blend the northern and southern styles. Careful excavation in London, in recent decades, has amassed a large collection of shoe styles from the Middle Ages. Since styles in the north usually lagged behind styles in Italy, innovations in the Italian cities probably took as long as 25 years to catch on in England.

Goatskin was called cordwain, and shoemakers were commonly called cordwainers. This was true even in England, where goats were a less important part of the economy than they were in the Mediterranean countries. Goatskin must have been one of the most common shoe materials in the early Middle Ages. After cow and sheep leather replaced it in England, cordwain continued to be the most common shoe leather in Italy, southern France, and Spain. Late medieval shoes for the wealthy were made of the most delicate calfskin or various kinds of woven fabric.

Although shoe styles changed from century to century, and different kinds of fasteners were developed, some general principles were constant. There was always a great difference in footwear between rich and poor, court and country. In every time, shoes were used by nobility at court to convey their status and wealth. Shoes wear out, and they are in contact with the floor, often with dirt. Anyone who can afford to have tooled leather, **embroidery,** or silk velvet even on his (or her) shoes must surely be wealthy.

Men's and **women**'s shoes did not look much different, if at all. In any given century, illustrations show us the same shapes, colors, and decorations. When rounded toes were fashionable, both sexes wore them, and when pointed toes came back in, both followed. In modern times, when shoes, especially men's, are relatively plain, the elaborate and gaudy styles of medieval men's court shoes make little sense. In Constantinople, fashionable shoes could show the toes or sides of the feet, as women's dress shoes do today. They could have embroidered bands around them or include sections of silk. When they laced, they usually laced along the side, leaving the top plain. These styles were all copied at European courts during the Middle Ages.

Boots came up around the ankles, while shoes ended at the anklebones. Some boots came up to the knee, while others enclosed the ankle and no farther. High boots were too expensive for common people, and most images of shoes show low-cut shoes or ankle boots. Boots to or above the knee were not much used until the Renaissance period, following the Middle Ages.

In all times, the poor were lucky to have shoes at all, and theirs were patched and plain. They kept to old, practical styles and often wore rags wrapped around their legs instead of hose. They used sturdier, thicker leather when they could afford it. Peasants' shoes were made from rough

or untanned leather. If they were working in the fields, they often removed their shoes to keep them from getting too muddy.

People of all classes wore wooden platform sandals as a type of overshoe to lift the leather shoe up from rain and snow. These were variously called clogs, pattens, or galoshes. They typically had a leather band the shoe slipped through, and some had a sandal-like strap at the back. The sole was made of wood, and it had arched pillars to support it. In some cases, the thickness was built up from layers of leather, but most often the whole clog was carved from wood. During the time that long points, called poulaines, were in fashion, these pattens or galoshes had extensions in front to hold the points up. In England, pattens were only in fashion during the 14th and 15th centuries, so many of them did have poulaine supports.

Shoe Styles

The story of shoe fashions in Europe seems mostly to be about the toes' points growing and shrinking. The earliest Viking Age shoes found in graves were simple shoes or boots with round toes, no decoration, and flat soles. The soles were made of thick leather and wore out quickly. They were cut off and replaced as long as the upper shoe lasted. By the 11th century, just before the Norman conquest of England, some shoes had pointed toes, but not as extreme as they became later.

Shoes found in excavations of Norman London in the 12th century mostly have drawstring ties around the ankle. The slots for the drawstrings were made of small parallel slits in the leather. The upper part of the shoe, the vamp, was cut from a single piece of leather. The shoes were simple, more like moccasins than like modern shoes. Some had a triangle of leather attached inside, at the heel, to stiffen it. They opened at the front, with overlapping tabs.

A common way of embellishing shoes for well-to-do townspeople was to sew a band of embroidery on the top of the shoe, from the toe to the shoe's throat. Most often, it was a stripe of plait stitch, an overlapping series of *X*'s that formed a solid, smooth, thick line. Colored silk stood out from the leather with a high sheen. Many illustrations show **saints** and kings wearing shoes with these vamp stripes.

The 12th century brought many new fashions as Crusaders and their retinues traveled and observed each other. After a distinguished Crusader wore shoes with elongated, pointed tips to hide the corns on his toes, a new fad caught on in France. Shoes were made with impractically long pointed tips, and sometimes they were shaped like tails of **fish** or scorpions. Aristocratic shoes were often heavily embellished with gilding and embroidery. As wearing hose caught on, hose could sometimes replace shoes. Some

pictures show men wearing hose alone; they may have been reinforced with a leather sole stitched to the cloth.

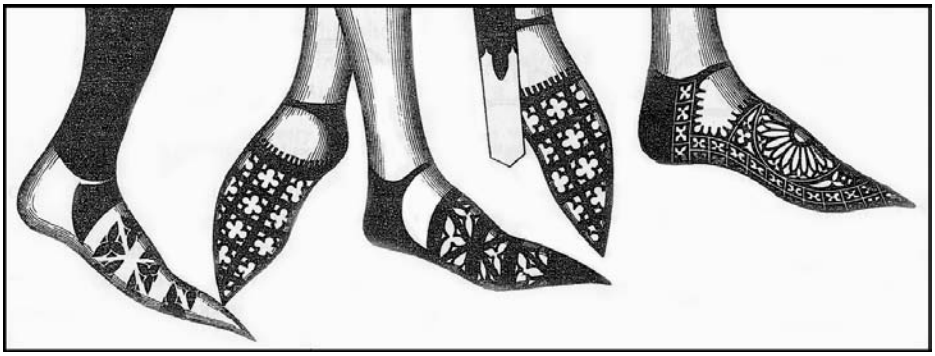
Shoe construction slowly became more sophisticated. Instead of large single pieces being cut and wrapped, moccasin like, 13th-century shoes used more separate pieces of leather. The heel sections, called quarters, were cut separately, and the vamp came in several pieces. It was more work for the shoemaker, but it used leather more efficiently and controlled the shape. The upper part of the shoe, the vamp, was more often made of fine calfskin in the 13th century. Shoes often had a cord stitched on the inside of a cut edge, to reinforce it. This permitted finer, softer leathers to be used. Most shoes came only to the top of the foot, but some had flaps that extended partway up the ankle.

Shoes in 13th-century London began to have side laces, as Byzantine shoes had for some time. The shoe opened only at the outside; it was solid across the top of the foot and on the instep. At the side slit, the shoemaker bored a set of holes similar to modern shoelace holes. They did not have metal grommets like modern shoes, but sometimes they were reinforced with a cord stitched around the inside of the hole.

In the mid- to late 13th century, shoes in London were often closed with buttoning toggles. The opening was again at the front. At that opening, a leather thong came about an inch or more out of the tongue. It had been folded back through a slit in itself, to make a knot, and then its free end was stitched inside the vamp. Around the ankle, two straps came to meet this toggle, with slits for it to button through. In shoes where the toggle has survived, some appear to be so long that they did not fasten the shoe tightly. There were fancier variations on the toggle fastening. In some cases, leather toggles came out of one of the straps and buttoned through slits in the other.

Toe points were not extravagant during the 13th century, but shoes for the wealthy were often embroidered and styled in various ways. One technique was to make decorative slits and cutouts in the leather so that the colored hose would show through. Since the slit was often at the side, the top of the foot was available to be decorated. The cutwork could be very elaborate, and it often covered most of the surface of the shoe. Excavated shoes have patterns of stamped circles, diamonds, squares, slits, and combinations of stars, triangles, and diamonds.

There were some tall boots that had pairs of straps up the ankle; one side had a toggle, and the other had a buttonhole slit. Other boots laced up the outside, with a side slit. The boots did not go up to the knee, but stopped just under halfway up. Boots were not fashionable; they were worn in certain professions, such as hunting. Royal huntsmen needed to wear fairly tall boots to protect their clothing and legs from brambles as they rode through **forests** and parks.



During the 13th century, the most popular kind of shoe decoration was a fine repeating pattern cut out of the leather. The design allowed the wearer's hose color to show through. Such shoes were only for indoor use; they were impractical outdoors or in muddy weather. (James Robinson Planche, *An Illustrated Dictionary of Historic Costume*, 2003)

Children's shoes were similar to adult shoes, but they tended to come higher up the ankle so that they could be laced securely. They more often had front fastenings, whether toggles or ties. They did not have pointed toes, but were practical and simple.

The 14th century was a time of rapidly changing fashion in clothing and hairstyles. In shoes, it was the age of pointed toes, sometimes to an extreme. The pointed tip was called a poulaine. It was usually stuffed with moss or fur to make it stand out or up stiffly. Most illustrations of 14th-century shoes show poulaines that were between two and six inches long.

London shoes were either very low-cut shoes or very tall boots, with little in between. Shoes were fastened with toggles, and boots laced at the side. Shoe construction was more standardized, probably reflecting the better organization of the cordwainers' **guild.** The top of a 14th-century boot was higher at the front, forming a point. A leather band was folded and sewn around the top to strengthen it. It was made of three or four pieces of cut leather, in addition to the sole. In some late 14th-century shoes, the sole was made in two pieces, with a separate heel. Soles had to be replaced and patched frequently, so perhaps this made it easier to replace a worn heel.

By the late 14th century, shoe styles became fancier and more extreme. They were cut low, and the area of the shoe's tongue was cut away to expose the colored hose. The shoe's tip became more extravagantly pointed. The shoe was held by a thin strap that came from the inner side and fastened on the outer side. There were two ways to fasten this strap. One was the buckle, the newest and most expensive fastener. The other was the

latchet, in which the strap split into two thinner thongs at the end and tied through holes at the strap on the shoe.

Expensive 14th-century shoes had decorated leather. The leather was engraved with a sharp tool so that its top surface was scraped away to expose a different texture and color. Shoes had a wide variety of finely engraved geometric or floral patterns. Since more and more of the vamp had been cut away to show the colored hose, the long poulaines had to carry on the decorative patterning.

Shoe buckles became almost universal during the 15th century. The price of buckles must have come down as the craft became more widespread. Shoes were often fastened with straps and buckles, either at the side or in the front, and sometimes a shoe style used more than one buckle. Boots opened at the front, fastened with buckled straps, and had a tongue.

Shoe points were modest at the beginning of the century, but by the later years, they had become so excessively long that the English Parliament made a proclamation forbidding cobblers to make points longer than two inches. Citizens with long, padded poulaines, especially when wearing wooden pattens with poulaine extensions, were tripping other people in the streets.

Shoe Making

Shoemakers were a skilled craft from early times and an organized guild in the 12th century. Originally, cobblers were a separate trade; they fixed old shoes and sold them at a discount. Cordwainers made new shoes, but they also repaired these shoes for customers. The trades gradually blended until *cobbler* became the standard word for a shoemaker. Around 1300, shoemakers developed a means of measuring shoe sizes. In England, the measurement was the barleycorn, about one-third of an inch. A system of measurement allowed merchants to sell shoes at fairs, ready-made.

Shoemakers worked at a bench and used special leather-cutting **tools.** One was a curved half-moon knife with a sharp point; it resembled the top of a pike, and it was often stuck in the bench by its point. Another was a large pair of shears that had long blades and were formed from a single piece of metal. Shoemakers used awls to punch holes and long needles to stitch together multiple layers of leather. To size and shape their shoes, they had carved wooden feet called lasts. In a time when pointed shoes were fashionable, the lasts were also pointed. Shoemakers also had patterns, probably made of cloth, to guide their cutting.

Soles were cut from the toughest leather, usually in one piece. The shoe's upper pieces were cut from finer leather or cloth, and the shoe was stitched on the wooden last, inside out. This kind of shoe construction was called

A late medieval woodcut shows the look of a shoemaking workshop. As in most medieval shops, customers could stand outside in the street and look into a window. One shoemaker could tend the counter, working as he waited for customers. The others sat close enough to the window to have some natural light. On the table, their cutting and stitching tools are piled up; they are stitching soles and uppers on their apron-covered laps. While some shoes were made to order, others were made in advance and hung for display in the window. By the late Middle Ages, there was a rough standard for sizing shoes, so that peddlers could take shoes out to distant fairs. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

"turn-shoe" because the shoe then had to be turned right side out. Specialized stitches had to be used to attach the sole to the upper so that the stitches weren't exposed to the friction of wear and tear. Some shoes were lined with cloth.

When a shoe's sole wore out, it was repaired with patches called clumps. These were stitched onto the outside of the shoe and often had separate heel and foreparts. Cobblers had methods of stitching these clumps on so that the stitches were entirely on the inside of the leather's layers. A repaired medieval shoe more closely resembles a modern shoe with its hard sole and separate heel.

Heavily embroidered shoes often had cloth uppers, since it was difficult to embroider on leather. Shoes could also have embroidered cloth strips stitched onto them. Embroidery on shoes was always in silk and used bright colors. The designs ranged from animals and flowers to decorative scrolls and moons. Leather strips could be gilded and stitched onto shoes, in combination with embroidery.

See also: Clothing, Embroidery.

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Sieges

In ancient times, **cities** often had strong walls around them, and warfare against these cities had always involved the basic tasks of breaking the walls, going over or under the walls, or starving the defenders into surrender. In the Middle Ages, Europe's decentralized political structure put a new twist on the siege by planting heavily fortified **castles** all over the landscape. Constantinople's thick city walls were similar to the fortresses of Roman, Greek, and more ancient times. Northern Europe, on the other hand, had several hundred small fortresses that were designed to hold off disproportionately larger attackers. In order to capture a region, an invader would need to besiege more than one fortress.

After the period of the First **Crusade,** knights returned with much grander ideas of defensive fortification. They had seen Byzantine fortress designs and had participated in attacks on Antioch, Acre, Jerusalem, and Tyre. Crusaders had built their own fortresses to hold the new territory, and they had used local engineering and labor to build much larger stone fortresses than Europe had at the time. When they came home, many rebuilt their family castles to incorporate the new defensive features. Castles became harder to capture by direct assault.

Sieges, attacks that stretched out over a long period of time, were the only way of capturing a castle unless it was taken by surprise. Sieges were expensive for both sides. The attackers had to sustain an army in hostile territory for a number of months, while the defenders had to make their **food** and **water** last. Both sides worked hard to attack or defend the walls. Walls could be broken down or surmounted by going over or under the walls. Siege machinery falls into three basic types. Catapults threw projectiles over the castle walls, either into the castle or from the castle toward the attackers. Rams battered the walls to make them fall down. Siege towers lifted attackers to the top of the wall so that they could enter.

Because of the high stakes and expense, sieges were not governed by the polite rules of chivalry. No trick was too dirty, gross, or savage. Treachery was one of the best ways of breaking a siege, if an insider could be bribed to

open the gates or tell of a secret weak point. **Poison** or bacterial contamination of food or water was a popular way to break a siege.

Climbing, Ramming, and Digging

The simplest siege weapon was the ladder. The attackers wanted to get into the fortress, and one way was to go over the walls. Siege ladders had been used against city and fortress walls since ancient times. Basic facts that governed the construction of siege ladders began with length: if a ladder was too short, it would not allow the attacker to go over the top, but if it was too long, its top would stick up where defenders could shove it away. The ladder had to lean enough to be stable, but it had to be vertical enough to be strong. The ideal siege ladder came to just below the top of the wall, and its foot was placed at a distance from the wall equal to about half its length. Since the walls of a town or castle were of varying heights, and were surrounded by varying terrain, the attackers had to build custom siege ladders for each position.

A refinement on the simple ladder was a ladder with a bridge. The bridge was a sturdy plank hinged at the top of the ladder, raised by ropes. The ladder had to be somewhat freestanding, like a platform, since it could not lean against the wall. Some engineers designed folding ladders that could be made in advance and carried with the army or ladders that could be assembled from short sections. Some sieges also used ladders made of rope or leather, with hooks at the top. These ladders were for quiet night attacks, when the ladders could suddenly appear hooked on top of the walls by long poles without the defenders having seen any ladders.

Defenders tried to repel attackers on ladders by using the force of gravity. Standing at a higher level, they could drop harmful substances on the climbers. Most often, they threw large rocks to knock the attackers off the ladders or force them to cover their heads. Sometimes they threw or poured boiling water, oil, or any other hot substances they had on hand, such as tar. They could also throw quicklime, a highly caustic, alkaline material that burned on contact. In sandy places, they could heat sand to red-hot and fling it down. In some cases, they could fling nets onto the attackers when they reached the top and trap them.

To protect against all these defenses, attackers used heavy shields. Since classical times, there had been siege shields made tall, curved back, or with a small roof, and at times on wheels. Many shields were large enough for more than one man. Medieval sieges used all forms of wooden shields, covered with leather. In the 15th century, the tall siege shield was called a pavis. It often had a spike to drive into the ground and a pole to hold it up.

Of course, the first defense against siege ladders had been put in place before the siege began, when the fortress was designed. Most fortresses

If a city or castle were not heavily defended, attackers could directly assault the walls with ladders. Ladders were a quick way to get to the top and over the wall, but in most sieges, the defenders were able to push the ladders back or drop stones on the men climbing up. A slower method was to dig under the wall, assuming it was not built on bedrock. In this scene representing a French assault on Genoa, an archer is working to keep defenders on the run, allowing the attackers to work freely. Normally, the city's walls were equally crowded with archers returning fire. (The British Library/StockphotoPro)

used a ditch or moat that came as close as possible to the outer walls. Attackers had to fill in the ditch with sacks or barrels of rocks and earth. In some cases, they resorted to using catapults to land rocks and dirt in the moat. Unless the ground was reasonably level approaching the wall, their use of siege machines would be limited.

If the attackers continued to try to go over the walls, but needed more than ladders, the next logical step was to make portable sheds. Sheds could be made fire resistant with water and fresh skins. Sheds could also disguise or protect structural attacks, such as digging or battering rams.

The purpose of a ram is simple. It is a strong tree trunk that hits a wall, gate, or door repeatedly until the object is smashed. The design of a battering ram had three aims: to strengthen the ram itself, to increase its force, and to protect its operators from counterattack.

The end of the battering ram was strengthened by a metal tip. Sometimes this was actually in the shape of a ram's head, invoking the ram's butting strength and using the ram's extended snout as the focal point of the battering force. More often, it was a blacksmith's **iron** binding so that the wood did not shatter as easily from the force put on it. The ram's bulk was suspended by ropes that could swing it, so the operators of a battering ram did not need much human power to strike with it. Longer ropes, of course, gave it more swinging power. The frame that suspended the ram was usually roofed so that its operators were protected from arrows or stones. Finally, the roof was often covered with damp **animal** skins as fire prevention.

Defenders dropped projectiles and hot liquids on the operators of battering rams. They could also try to disrupt the action of the ram, if the ram's housing was too well defended to be vulnerable to rocks or fire. When the ram struck the wall, they could try to hook it and pull it up, either deflecting its blow or flipping its shed over.

Battering ram technology had been well explored during classical times, and, although rams were still used, castle designers built walls to withstand them. The thickest parts of the walls were at battering level, and gates, the main target of rams, were protected by gatehouses and moats. Attackers had to find new ways to use rams during the Middle Ages. Small rams could be mounted on ladders and lifted up to smash parapets. Attackers could build an earth ramp to a higher point in a wall, where it was likely to be thinner.

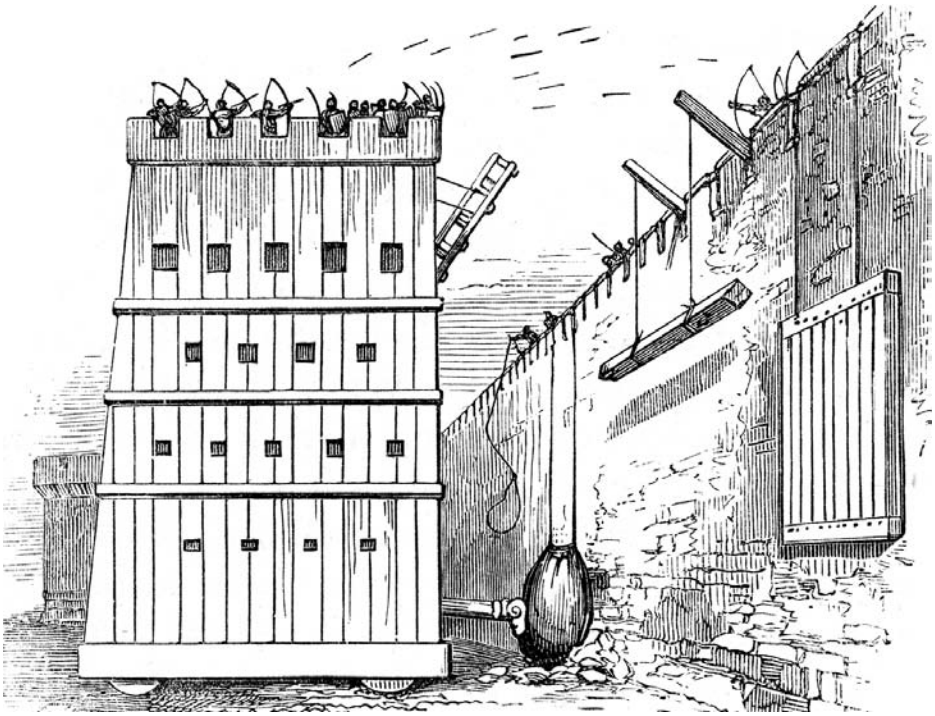
Attackers could also try to drill holes in the walls. Borers, too, had to work in the shelter of sheds and shields. It was not easy to drill holes in **stone** walls, so borers were more commonly used against **brick.** They were not a large feature of Northern European siege warfare, since most French and English castles were made of limestone and granite. A strong brick wall could be sufficiently weakened by holes that a ram could bring it down.

Holes could have wood pushed in and set on fire, and the heat further weakened the walls.

By the 14th century, castle walls were built to be too high and thick for ladders and rams to be effective. If ladders and rams could not boost attackers over or batter walls down, a more elaborate machine could be built. A siege tower was a heavy, cumbersome machine, not designed for a lightning attack or for secrecy. It was part of an all-out assault on a weakened castle. The tower was a tall wooden structure on wheels; it was sometimes called a castle or a cat. It had protective walls and a roof and was fireproofed if possible. Inside, it had wooden floors as stories where attackers could stand. A ladder led from bottom to top, so each layer of attackers could climb the ladder in turn. A top floor allowed archers to give further defensive cover to the attackers. The siege tower also had a bridge to cross to the top of the wall. This bridge could be a drawbridge, operated by a windlass in the bottom story.

Certain engineering issues governed the construction of siege towers. They had to be tall enough to reach the walls and stable enough not to tip when loaded with climbing soldiers. They also had to be portable, usually on wheels. Medieval siege towers were as tall as 75 feet high, but they were often shorter. Designs in medieval illustrations appear to favor a small fortress on a rolling platform, reached by one or more ladders. The attackers expected a tough fight before they could cross a bridge, and they designed it to have walls or even a roof. Other siege towers were more like rolling platform ladders with bridges. The builders had to think about fire, since the most common way to defend against a siege tower was to set it on fire. In the Byzantine region, siege towers became obsolete when it became clear the defenders would hurl Greek fire at them. Northern Europe was able to use siege tower tactics longer, since it was easier to defend wood against ordinary fire. The tower could be roofed with fresh turf or newly skinned wet hides.

Siege towers were heavy and could easily tip over. It was difficult to move them into position from the safe distance where they had been built. The ground had to be level, and many teams of oxen were needed to move them. They also needed to be moved close to the walls, which normally meant that pushing, not pulling, force was required. One way to move a very heavy siege platform was to sink one or more posts into the ground by the castle walls and loop heavy pulleys and ropes around them. The platform was then attached to the ropes, and it could be moved forward by oxen walking away from the battle. The siege tower inched closer to the fortress walls, but the muscle power moving it only moved farther out of range. The tower could come right up to the pulleys, if the defenders had not disrupted them. Towers could also be moved with levers, but, in any case, they moved very slowly because of their great weight.



One of the oldest methods of carrying out an attack on high walls was the siege tower. The siege tower had to act as a covered ladder that also defended its passengers from fire. When it had been moved close enough to the wall, the siege tower dropped a drawbridge and the attack began. (Duncan Walker/iStockPhoto)

Undermining a wall could be the most successful attack, and there were fewer ways for the defenders to work against it. Ideally, the defenders would not know that sappers were digging a tunnel under the walls. The first somewhat successful underground attack in medieval times was carried out by the Vikings when they besieged Paris in 885. After the Norman conquest of England, mining was part of many sieges. The siege of Rochester Castle in 1215, when King John of England was putting down a rebellion, was one of the few times when mining was a key factor in the castle's surrender. Miners dug under two outer walls so that the defenders were trapped in the keep. Château-Gaillard, built by King Richard I of England, was designed to be impregnable, but miners collapsed its walls twice. Mining was a large part of Crusader warfare, on both sides.

The best location to begin a sapping operation was in a place where the defenders could not observe what was going on without leaving the fortress. Sappers sometimes needed to start some distance away, on the other side of a hill. The attackers could put up a wooden palisade so that the defenders could not see what they were doing on the other side. If the

diggers had to start in a place where the defenders could observe them, they needed a strong shed to protect them. The shed was sometimes nicknamed a "tortoise" or a "sow."

An attacking army drafted industrial miners to dig their siege tunnels. Since stone was tunneled from deep underground, even from under the city of Paris, miners knew how to dig any length of tunnel required, through any materials. Beginning in a safe place, they dug underground and moved in a carefully planned direction toward the walls. Sometimes, two tunnels were dug as parallel galleries. As the miners tunneled, they shored up the walls of the mine with strong timbers. Mining was an operation that required a large number of laborers, which made it difficult to carry out deep in hostile territory.

When a tunnel successfully reached a point under the defensive wall, the miners nearly always started a fire. The intense heat caused the ground to expand, which cracked the walls and collapsed the tunnel. Added to the wood carried into the tunnel, oil and fat made the fire burn hotter; one mine fire, in the siege of Rochester, used 40 pigs as sources of fat. The wood props securing the tunnels also burned, allowing the tunnels to collapse faster.

Once **gunpowder** was in use, it was even easier to produce a hot blast. It was harder to get away safely, since the combustion happened so quickly and the blast collapsed the tunnel. The best way was to approach the wall with snake-like curves and then use the curved passages to set a long fuse, out of sight and reach of the blast. As the fire crept along the fuse, the miners could escape out the end of the tunnel. Since gunpowder came into use at the end of the Middle Ages, it did not become a major force in siege mining until the Renaissance period.

Most walls collapsed when the ground supporting them caved in. There were few ways to build walls that were not vulnerable to sapping. One way was to reinforce the walls with stone columns laid like pegs through holes in the building stones. Places with ruined Roman or Greek columns could use them this way, but most places did not have ruined columns. The fortress design could also use very deep digging to place a moat or a wall in vulnerable places.

Defenders tried to detect tunnel digging when they could not see it. A bowl of water, set over an area being mined, quivered with the vibrations of the tools. If they could tell where the miners were approaching the wall, the defenders could dig down to meet and surprise them with combat. They could sink a hole nearby and try to set the attacking tunnel on fire, or they could flood it if they had a moat or river inside the walls. The attackers tried to make their tunneling less predictable by making decoy tunnels or by making the tunnels take unexpected paths. Tunnels could branch out, or they could zigzag or curve.

Ballistic Machines

Machines that threw projectiles were known by many names in their time, although today we refer to them all as catapults. There are a few simple forces that can provide ballistic power without explosives or motors. Levers and gravity can be harnessed to provide flinging power. The power of both tension and torsion derive from a material being bent so that it will spring or unwind back to its original state.

Tension engines worked by bending wood; it would spring back to shape when the tension was released, thus flinging a projectile with the force of its movement. Crossbows and longbows work on this principle, and some larger forms of crossbows could act as siege weapons, throwing larger projectiles. These great crossbows were built on a frame and used a windlass at the back of the frame to wind the bolt on its string far back. When the windlass was released, the wooden bow's tension thrust its heavy bolt forward with speed and great force. But wood's ability to bend and snap back is limited by its tendency to crack. Wooden bows could not throw anything larger than a bolt and could not take aim at walls, but only at people.

Torsion is the force exerted by a rope that has been twisted tightly and tries to untwist. It is the principle of a child's toy boat or airplane that uses a rubber band wound up tight to drive paddles or propellers as it unwinds. Torsion had been used to drive throwing machines since ancient times. The Romans had a throwing machine called an "onager," a wild donkey. It used a very thick band of rope, highly resistant to being twisted, as the torsion spring. When a lever was inserted into the torsion spring and cranked back so that the rope was forced to twist, on release it sprang into the air. The lever had a sling on the end with a heavy stone. As it sprang into the air, it struck a bar that stopped its movement, and the stone flew out of the sling. The onager's simple torsion spring provided great velocity and force.

Medieval uses of the torsion spring are not as clear. There is evidence that torsion machines of this kind were known in the time of Charlemagne. Artists' illustrations show a machine similar to the Roman onager, but instead of a sling at the end of the lever, there is a spoon-shaped cup for the rock to be placed in. It was probably called a mangonel. Turkish medieval sources picture a device similar to the Roman one, called a *manjaniq,* used by **Muslim** armies.

In the 14th century, there were large crossbows that did not use bent wood, but rather had two separate arms with torsion springs. Different types were known variously as ballistae and espringals (and in other languages, *springarda* or *springolf*). They were more often used by a fortress's defenders, since they shot bolts at individuals, rather than rocks at walls. The espringal was built into a wooden frame, mounted on a tower. On each side, the frame had a torsion spring made of very thick horsehair rope that was resistant to twisting. Levers inserted into each spring were pulled back

by ropes attached to the firing mechanism. The espringal's firing system was like a crossbow, with a long groove for a bolt. The operator cranked the bolt back, pulling on the levers and the torsion springs. Released, the torsion springs untwisted and the levers shot the bolt forward, through the groove and out toward the target. The bolts were long and heavy. They could be expected to pierce wooden shields, steel armor, and sometimes more than one body.

The third type of throwing machine used levers and gravity. Since ancient times, people had known that if a lever is put over a fulcrum, like a seesaw, and the lengths are not equal, it takes a much heavier weight on the short end to balance a lighter weight on the long end. If the short end is suddenly weighted, the long end will fly into the air very fast. Unlike tension and torsion, which depend on the strength of bent wood or twisted rope, lever-based machines can throw very heavy objects with relative ease. As long as the lever's arm and the stand with the fulcrum hinge are strong enough, there is no load limit.

The perrier used only the lever to fling large stones. The perrier depended on a sudden downward pull by men or horses. Its frame lifted the lever's short arm above the men's heads, with a rope dangling down, and the long end rested on the ground with a sling. They could load a heavy rock into the sling. When the payload was in place, men with ropes pulled the short end down, as hard as they could, and the long arm with its rope swung upward suddenly, flinging the projectile into the air. In order to achieve significant force, the pull had to be both sudden and hard. Many ropes attached to a bar allowed many men or horses to pull. Sudden pull could be achieved by having the throwing arm restrained by a latch as the men began pulling, so the latch could suddenly be released. The perrier may have been in use by the 11th century.

The trebuchet used a lever with a very heavy counterweight on its short end. The long arm, with a sling on the end, was winched to the ground, forcing the boxy counterweight to lift into the air. Men loaded a large stone into the sling as the long end was held down firmly. When the long arm was released, the counterweight fell to the ground, suddenly lifting the long throwing arm and releasing its sling-propelled payload into the air. Because the machine's power depended on gravity to pull the counterweight down, not on men or horses to tug it hard, the trebuchet was the strongest of the throwing machines.

Trebuchets could be built larger and stronger to throw ever-larger payloads. Instead of a windlass, the winching could be accomplished by one or two wheels, the way the tallest cranes raised loads. Several men stood inside the wheel and walked on its steps, using their weight and a pulley system to magnify the force. The counterweight, perhaps by now a large wooden bucket filled with many large stones, slowly lifted into the air. The throwing

A wall painting shows an elegant view of a castle siege using a trebuchet. Just as the defenders are out of proportion to the size of the castle, the trebuchet shown is far too delicate to handle the real work of a catapult. The artist has captured the basic essence of a trebuchet, though: a weight (shown as a square against the dark diapering design of the wall) will suddenly drop, and this momentum will fling the other arm into the air. The stone, shown cradled in a basket, will gain extra force from the additional swing of its rope. A succession of stones might succeed in damaging the wall sufficiently to pull it down. (The British Library/ StockphotoPro)

arm was lashed down, the men got out of the wheels, and the counterweight could be released.

Rocks are the best-known catapult payload, and they were the most commonly used. A machine could deliver a series of rocks to the same spot on a wall if the rocks were the same weight and the machine had not been moved. This pounded the wall over and over, increasingly weakening it. Iron shot was even better than stone shot, but it was more expensive.

As a siege went on, trebuchets were loaded with new payloads that were intended to frighten or harm the people inside. The trebuchet was now aimed to fling over the wall, not at it. Most often, armies threw dead animals or even dead human body parts. Severed heads were a common payload. Corpses spread disease, a deadlier attack than any rock. An assault with corpses was also a psychological terror weapon, especially if the heads or other body parts belonged to the targets. Trebuchets could also fling manure.

A shrapnel effect came from "beehives"—clay pots packed with rocks. They burst open on contact, and the rocks flew into the town to smash windows and injure people. Armies also threw incendiary mixes, such as hot tar and quicklime. Incendiary mixes were often called *naphtha;* there are a few existing recipes. Quicklime was the key ingredient, because water causes combustion on contact. Other ingredients were flammable substances: pine pitch, tar, oil, animal fat, and dung.

Greek fire was the most famous incendiary compound of the time. The name "Greek fire" caught on because it was invented in Constantinople, after they had lost territory to the invading Muslims. Byzantine soldiers used catapults to fling pots of Greek fire at besieging Muslim armies. It caught fire on contact, and even water did not put it out. They could pump it at attacking ships and burn up whole fleets; in this way, they saved Constantinople in the seventh century when other cities were conquered by the invading Arabs. The secret composition of Greek fire was carefully guarded for a long time, but eventually first Muslims and then Christian Europeans learned how to make it. It became a component of trebuchet attacks during sieges. However, there is no surviving account of what was in Greek fire. Many scholars speculate that it must have contained quicklime or saltpeter, and others believe it had to use petroleum as a main ingredient. The use of petroleum in some form seems very likely, since Greek fire was described as a liquid that burned even on top of water.

After the introduction of gunpowder, cannons became the main siege-breaking weapon. The largest cannons, called bombards, required large trains of horses and oxen to move their parts and heaps of stone shot. They had to be moved off their wagons with large cranes, and they were fired either from heavy wooden frames or from trenches dug into the ground. The idea was not to fire the stones or iron balls into the fortress, but to fire them straight at the defensive walls. A bombard that was placed lower to

the ground could aim right at the ground level. It was most effective when it was close to the wall, its operators defended with wooden walls.

See also: Armor, Castles, Gunpowder, Weapons.

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Silk. *See* Cloth

Silver. *See* Gold and Silver

Slaves. *See* Servants and Slaves

Spices and Sugar

Medieval cooks considered anything used for flavor to be a spice. Their spices included the ones we are familiar with: cinnamon, nutmeg, ginger, cloves, and pepper. They also included what we call herbs: thyme, sage, mint, and parsley. But medieval spices included a range of ingredients that we would not think of, such as dates, figs, almonds, and even grape juice. Sugar was a spice. Anything that could change the flavor of a meat dish was a spice, and medieval cooks used all these ingredients in all dishes on the table.

The use of spices was often a matter of conspicuous display of wealth. Imported spices were in the top rank, because they were the most expensive. Imported sugar may have been the most expensive of all. Saffron, a spice native to Europe, was also extremely expensive, so it too was favored by cooks for the aristocracy. Herbs native to Europe were considerably down

the scale of fashion and did not figure much in the most luxurious recipes. Cooks knew that their diners wanted expense and display.

The spices imported from the Far East were pepper, cloves, nutmeg, mace, cinnamon, cardamom, and ginger. These had been imported since Roman times, shipped to Middle Eastern ports and then into the Mediterranean Sea, but the supply dwindled to an expensive trickle during the years of barbarian invasions. After **Muslim** Arabs conquered most of the Mediterranean, shipping and travel became more dangerous, and spices were scarcer and more expensive. Only the richest could afford the few spices that still entered Europe. But in 1099, the First **Crusade** set up a kingdom in Palestine and its surrounding fortress cities, such as Antioch. For the next 200 years, knights, **masons,** merchants, and other workers flowed back and forth to support this kingdom. Trade in spices soared. Venice, Genoa, and other maritime cities obtained exclusive trade contracts for certain routes and places, while those places became wealthy by charging fees. Alexandria, Egypt, was one of the main hubs of the spice trade.

The most popular imported spice of the Middle Ages was pepper, and Europe was never entirely without pepper even during the years of most privation. Pepper's use was restricted to the aristocracy, though. It took a greater supply and a lowered price for pepper and other spices to become part of commoners' lives. When the spice trade was reestablished following the Crusades, spices became more common and were available to some well-to-do merchants and craftsmen. In the later Middle Ages, after 1350, as pepper became more available to the common man, it lost fashion among the rich. Fewer recipes used pepper. By the close of the Middle Ages, pepper was viewed as the spice of the poor.

Medieval recipes were generously spiced. Sauces for meat included not only salt and pepper, but also ginger, cinnamon, cloves, mace, cardamom, and saffron, and often all at once. The wealthy, whose households kept **records** still in existence today, purchased spices in staggering quantities. Their cooks used upward of a pound of assorted spices a day to make their stockpots of stews and sauces for the castle's household. While some meat and fish were eaten fresh, much of it had been salted, and this saltiness was probably the driving force behind recipes that chopped meat fine, mixed it with other ingredients, and drowned its taste in spices. Fresh meat, too, such as venison or pork, was stewed or dipped into sauces seasoned with cinnamon and ginger.

Many history books say spices were used to cover the taste of spoiled meat or fish, but this does not hold up in a closer examination. Medieval cooks and diners were aware that eating spoiled meat made people sick, although their ideas of the mechanisms of food spoiling seem quaint and were too heavily focused on the smells and bad air. Spices were probably used as preservatives, and spoiled meat could be a problem, but merchants

A 15th-century painter imagined the pepper harvest in the exotic, distant, unknown East Indies. To the right, natives were hard at work picking pepper corns from bushes. To the left, a merchant offered the results to a European king. Trade in pepper and other Indian spices drove Europeans to explore the oceans, each trying to find a way to corner this lucrative market. (Bibliotheque Nationale, Paris/The Bridgeman Art Library)

who sold spoiled meat were subject to harsh punishment, such as time in the public stocks.

A wide variety of herbs and spices were native to Europe. Some were very common and were used only by the poor, who might gather them or buy them for pennies at the market. Mustard grew wild all over Europe; the yellow condiment we call mustard today began as a medieval sauce made from vinegar, honey, and mustard seed. Sage, basil, fennel, mint, parsley, rosemary, cumin, coriander, and thyme grew wild in various regions. Crab apples, too, were gathered for their sour flavor. Garlic, chives, and onions were the most common seasoning for the poor.

Saffron is made from the dust on the stamens of crocus flowers. These flowers, imported from Persia, were grown all over Europe, but it took hundreds of crocus stamens to make any amount of saffron. The sheer time and work required to make an ounce of saffron made it one of the most expensive spices, and therefore it was much valued for its bright color and distinctive taste. Other flowers had scents valued as flavoring in confections: roses, violets, and the flowers of the elderberry bush and hawthorn trees.

Spices also formed the basis of many **medicines.** Physicians believed that the four humors of the body—hot, cold, wet, and dry—must be kept in balance. They believed that disease was an imbalance of these humors and

that fever was the body's attempt to rebalance a system that had dropped toward being too cold and wet. The remedy was to ingest or apply something that was hot and dry. Spices like cinnamon and pepper were considered the hottest, driest substances, so they formed the basis of many medicines and poultices. Ginger was hot and wet, a rare combination, and a much-valued medicine for some diseases. Spices had the additional value of being expensive, so only the rich could have such medicine.

Sugar entered medieval Europe as an expensive import from the Middle East, although sugar cane had originally come from the Far East. Around the year 1000, the Arab empire set up a sugar refinery on the island of Crete, which they called Qandi, meaning "crystallized sugar." The English word *candy* clearly comes from this Arabic word.

Crusaders withdrawing from Palestine in 1291 established a kingdom in Cyprus and grew sugar there. The republic of Venice shipped sugar from Cyprus to the rest of Europe; so did Genoa and the Hanseatic League. As the distance from sugar producers grew, the price went up, because each port it passed through imposed a toll or tax. The price of a loaf of sugar in France or England was as much as its weight in **silver.**

The most common "candy" was candied whole spice, whether ginger, nutmeg, or even pine nuts. Nougat, a confection of sugar and nuts, was invented during the Middle Ages, probably in Spanish-Arab Andalusia. The Arabs also invented caramel, *kurat al milh,* meaning "ball of sweet salt." Caramel was sometimes used to remove unwanted hair, the way we now use wax. Ordinary medieval Europeans never saw or imagined these sweets; their availability to the public would only come with the New World trade in the next era.

Very few sweet desserts were part of the medieval European table. Almost all the cookies, cakes, and pies that we consider part of traditional European cuisine were developed later. However, toward the end of the Middle Ages, some cooks developed gingerbread. The earliest gingerbread was millet gruel boiled with honey, with spices added. Poured into a mold, it cooled and solidified, then was baked. The first true gingerbread came from Reims in the 1420s, when a bakery invented a spice bread made from rye flour, dark buckwheat honey, and spices. Sometimes this bread was cut into cubes and dipped into the spicy meat sauces at dinner.

See also: Food, Gardens, Medicine.

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Stained Glass. *See* Glass

Stone and Masons

Stone was the high-tech building material of the Middle Ages. Wooden buildings predominated in the early centuries because stone was so expensive. Only palaces and churches were stone, at first. By the 12th century, **castles** had to be stone, as did **city** walls. By the end of the Middle Ages, many **bridges,** some **roads,** and many **houses** were stone. Estimates suggest that more stone was quarried in medieval France than in ancient Egypt to build the pyramids.

Stone was used for other purposes than just building blocks. Italian marble was carved into monuments; marblers were very specialized stonecutters. Slate broke into flat slabs to make roof tiles. Limestone and chalk were burned to produce quicklime, an element of mortar. Large limestone kilns used acres of **forest** as fuel; they were among the first to convert to **coal** when it was discovered in the 13th century.

Stone building was planned and overseen by master masons, the architects of the Middle Ages. They signed a contract with the owner and acted as general contractor to hire other skilled workers to carry it out, under the stipulated budget. They drafted the plans and drawings, inspected buildings, and supervised stonecutting and actual building. Other masons were rough masons who hacked out rough shapes at the quarry, stonecutters who made precision blocks, and freemasons who could carve anything in stone, including window tracery and other sculpture.

Some stone quarries were owned by the king or by **monasteries,** others by private owners. France was the region most heavily quarried for building stone; much of it came from Caen, in Normandy. It was fantastically expensive to have stone moved far, so builders usually searched for places to quarry it locally. When only Caen limestone would do, the stone had to be moved by **boat.** In a few cases, it was best to dig a canal just to transport the stone to the building site.

Medieval quarries tunneled into the hillside, creating long galleries that ran parallel to each other or branched off in mazes. The tunnels were propped up with rock pillars, or the stonecutters left natural pillars. Paris has tunnels where the stone quarries dug down under the city. There are more kilometers of medieval quarry tunneling than of the modern Paris subway.

A 15th-century artist represented the importance of stone by showing masons towering over their building project. Each is working with typical masons' tools on a different phase of cutting, shaping, and placing blocks. In the far upper left corner, there is a windmill against the horizon. (The British Library/ StockphotoPro)

Rough masons used stonecutting **tools** in the quarry, such as picks, mallets, and chisels. These had to be sharpened frequently. When possible, stones were cut to order at the quarry. Master masons sent written orders with sticks marked to the size of the stones to be cut or canvas cut into patterns. In the quarry or in their lodge workshops, the rough masons cut the

stones of a building to precise patterns. Sometimes stone pieces interlocked to form a weight-bearing pillar. Many stones had carved patterns; dressed stone like this was called ashlar. The stones were marked to show where they fit into the finished wall.

After 1300, architectural drawings were more common, and many have survived into the present. The earliest are on **parchment,** later ones on **paper.** Some were very large, drawn on several parchments stitched together. Some show several elevations superimposed on each other, in two dimensions. A tower that grew narrower at the top could be drawn as if it were a series of walls inside each other, showing their relative size and shape. Much of the mason's art and training was in understanding these drawing conventions and knowing how to interpret them. By the master mason's directions, the patterns were drawn full-size on a tracing floor that had a fine plaster coating that was easy to mark. Carpenters used the shapes on the drawing floor to make wooden forms that the stonecutters used to shape the stone pieces into replicas of the shapes laid out by the master mason. Accurate replicas were especially important in assembling Gothic arches and tracery.

Foundations were laid out with pegs and strings, and until the 11th century, walls were not always perfectly straight or perpendicular, but from the 12th century on, they were very geometrical. Master masons were very aware of the importance of good foundations and shored up soft ground with driven piles.

To build a wall, masons used only the classic trowel, identical to those used by bricklayers today, and a simple level. The level consisted of a flat piece of wood with a triangle built onto its surface; from the apex of the triangle hung a short line with a weight. When the base was on a perfectly level surface, the weight hung down to point at a mark directly under it. Any deviation from this level caused the weight to hang to the right or left of this central mark.

Builders used scaffolding similar to the modern kind, consisting of strong but temporary poles and shelving. The shelves in a medieval scaffold were made of wattle (woven branches) rather than solid boards, and the frame was tied together with rope. Builders often built round towers by inserting poles into holes built into the wall as they went and raising a spiraling walkway as they built. Ladders often connected levels, but they also made walkways by weaving flexible splints into the ladders' spaces.

See also: Cathedrals, Tools.

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Sugar. *See* Spices and Sugar

T

Tapestry

Tapestries are among the first things people think of when they picture Europe in the Middle Ages. However, they were really an art form of the later Middle Ages and were only found in churches and **castles.** The most famous tapestry, the Bayeux Tapestry, is not even a tapestry. It is an **embroidered** linen wall hanging. True tapestries were decorative cloth wall hangings; the picture was woven into the fabric, not stitched onto it. They were made on very large looms, with painstaking care, by trained professionals.

Tapestries before 1300 are scarce and primitive, perhaps produced in home workshops or convents. Tapestry became a guild craft during the 12th century, and the 15th and 16th centuries were the peak of the tapestry industry's art. The workshops clustered in the **cloth**-producing regions of Flanders and northern France. Paris and Arras led tapestry weaving in France, and in Flanders, the most famous tapestry cities were Bruges, Ghent, Lille, and Tournai. The trade spread into places like Italy only by the emigration of Flanders-trained weavers.

Only the wealthiest patrons could afford tapestries. The price of a tapestry varied with the materials used (wool was the least expensive) and the level of detail desired. When finer threads were denser, more detail was possible, but the weaving slowed, and the tapestry's cost soared. On average, a tapestry weaver did very well to produce 10 feet per year. The price of a very large tapestry was astronomical. Less wealthy patrons had small tapestries or mere imitations—fabric with painted pictures.

The **church** may have been the greatest customer for tapestries. A long tradition going back into the early church of Roman times specified that on special **feast** days, churches had to hang decorative fabrics. Popes gave silk and **gold** hangings to churches, and local donors gave money to be used for hangings in their memory. Many of these altar cloths and banners were embroidered, but as tapestry craftsmanship spread, large churches collected woven hangings. Church officials such as wealthy canons, or royalty on the church's behalf, commissioned large tapestries to hang in the choir stalls, completely covering the space. Some of these tapestries were very long, close to 100 feet. They were usually about 6 feet tall, so they formed very long strips of pictures.

Liturgical tapestries usually illustrated the lives of a church's patron **saints,** and they usually included text that explained the action. The scenes of action were divided by decorative pillars or walls. As in other medieval art, the costumes and buildings depicted in the saint's story were contemporary; Roman guards wore 15th-century hats and doublets, and every town had a crenellated wall around it. The medieval love of the exotic brought unicorns, lions, and monkeys to the death of Saint Stephen or a newly invented late medieval **clock** tower into the buildings of Rome.

Tapestry designs were busy. A picture for a tapestry had many human figures, many animals, and wildflowers scattered across the grass. Not all designs were liturgical, of course. Secular tapestries showed **hunting** scenes and **gardens;** men blew horns and tended dogs, while groups of ladies walked, read, and sang in gardens. Some tapestries had **ships,** heraldic animals, kings, or castles. Unicorns were always popular.

The millefleurs style was characteristic of 15th-century tapestries. They displayed many small flowers scattered on a solid background. The flowers are always shown as whole flowering plants, with as much variety as possible. In the famous Unicorn Tapestry at the Cloisters of New York's Metropolitan Museum of Art, the white unicorn sits in a small enclosure, surrounded by more than 80 different types of flowers, most of which can be identified by naturalists: orchid, Chinese lantern, carnation, Madonna lily, thistle, columbine, pansy, marigold, and many more. A millefleurs tapestry typically had a central design—often an enclosure with an animal, but sometimes a group of other figures. The background color was most often green, to represent grass and make the tapestry appear to be a natural garden, but some tapestries used other colors to good effect.

Making a Tapestry

The making of a tapestry began with sketches and proceeded to a full-size cartoon. Sometimes the tapestry was first painted onto a large piece of cloth to see the full effect. Professional artists, not weavers, made these drawings and cartoons. When the patron had approved the design, the cartoons went to the weaving shop, where they became the shop's property. Unless the patron bought the cartoon or painted fabric test piece, the weaving shop was free to make a copy and sell it. Sometimes the patron used the painted fabric as a wall hanging while the tapestry was in production; the less wealthy used nothing but painted fabric hangings.

The warp was a strong wool thread in a plain color. Weft threads were usually fine wool and sometimes silk. Silk had a sheen that could be used for a lightening effect. Gold and **silver** threads also were used for effect. Wool dyes were simple, compared to artist's painting tints. Using madder or brazilwood for red, weld for yellow, and woad or a type of indigo for blue, dyers created the secondary and tertiary colors and many shades. Dyers added a mordant, a chemical that fixes the dye to the yarn; it was often a metal such as aluminum or zinc. Even the most colorful medieval tapestries appear to have no other substances but these few dyes and mordants.

Tapestry weavers worked on both upright and horizontal looms. The vertical loom is called high warp, and the horizontal loom is low warp, but the tapestries they produced were identical. The high warp technique came first. The weavers stood in front of a beam that wound up the finished fab-

ric as they worked. The warp was stretched tightly to an overhead beam that unrolled the length of warp as the weavers moved upward. A simple drawstring system, connected to a bar, lifted alternate threads to create a shed, a space where the bobbin could be passed. On the low warp loom, the arrangement was similar; a beam at the front rolled up the fabric as it was produced, and the warp was stretched and rolled around a back beam. With a low warp loom, the drawstrings that raised or lowered alternate threads were connected to overhead pulleys and foot pedals, leaving both hands free to weave.

Up to six weavers, but on average three, worked side by side at these large looms. On a low warp loom, each controlled a section of warp with a set of foot pedals. The width of the tapestry was the desired height as it hung in the room, and if a tapestry was not designed to be square, it was designed to be longer against the wall than it was high. For this reason, the weavers worked on the pattern sideways; the warp threads that stretched in front of them would run horizontally when the finished tapestry was mounted on a wall.

They worked with their fingers, pushing a bobbin of colored thread up and down through the warp threads. Small details would use the width of only a few warp threads, while large colored areas, such as blue sky, would carry the bobbin across many warp threads before it came to another color zone. Bobbins not in use hung or laid at rest on the finished fabric. At any given stretch across the piece, anywhere from a few to a hundred different bobbins could be in use. As they wove, the weavers used combs to pack the weft to a tight, even density.

Sometimes, the artist's cartoon was stretched under a horizontal loom so the weavers could look down and see it. If they were working on a vertical frame, the cartoon hung on a wall, but not immediately behind the vertical loom. Weavers had to turn and look at the cartoon, then turn back to the warp. They used charcoal or chalk to sketch the design onto their warp threads. The design was worked facing away from the weavers, who saw only the back of the tapestry picture. This way, they could secure threads in ways that could not be seen from the front. On a high warp loom, the weavers could walk to the back to see the front. On a low warp loom, they needed a mirror on the floor to see the front as it developed. Weavers never saw the whole picture until it was cut from the loom.

At points where colors joined, the weaver could wrap both colors around a warp thread that formed the boundary, a technique called dovetailing. Since two colors shared that thread, one to the left and one to the right, the boundary was slightly blurred. Weavers could also interlock the colored weft threads around each other as each color turned back; the join was invisible at the front. At points where the design required a crisp line between colors, the weaver would leave a slit between them; one color turned back

the way it came, not touching the other, which also turned back. Slits had to be small because they weakened the fabric's strength. The weaver then stitched the slits closed on the back of the tapestry. The last step in finishing the tapestry was to stitch on a protective linen backing.

Tapestry weaving was very dense; the weft threads were packed hard against each other. Especially in late medieval tapestry technique, the patterns were extremely detailed and used many shades of color. A man's **hair** was not a single brown; it was a fine pattern of dark and light browns that created an illusion of hair strands with sun shining on them. Robes required many colors to form the shadows and folds of cloth. Skies were not purely blue but had shades of blue and white cloud. At the horizon, tiny **houses** and castles were worked against the sky.

See also: Cloth, Embroidery, Painting.

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Taverns and Inns

Taverns were a natural outgrowth of the ale home-brewing industry. Many women in the town and the country brewed ale in quantities greater than their families could drink before it spoiled. The simplest kind of tavern was a private house that permitted customers to sit at a table in the front room and drink the ale they had purchased. The traditional English symbol for a public house was a pole, broom, or branch posted above the door.

As **cities** grew, some taverns became businesses separate from home brewing. They named themselves "The Cock" or "The Vine" and had colorful pictorial signs. Taverns that did not brew their own ale or beer became tied to certain brewers with whom they kept purchasing accounts, especially in Germany and the Netherlands. Taverns in wine-growing regions sold only wine, but since wine was widely imported, London customers at large taverns could buy sweet Greek malmsey or any of 50 French or Italian wines.

Some taverns sold **food,** although many did not. When a tavern did sell food, the fare was likely to be simple and not likely to spoil, such as salted **fish.** Tavern keepers could also buy bread from a nearby bakery. Many taverns were prevented from cooking on the premises, since **guild** regulations did not include cooking. They could buy salted beef, bacon, pies, or other food from cookshops; customers could also buy from cookshops or street vendors and carry the snacks in. Cookshops sold small meat pies, often in trays carried by street criers. They also offered pieces of roast meat (hot off the spit or griddle) and hard-boiled eggs. Street vendors made some things right on the street, over a small charcoal fire. One such treat was the wafer, something like waffles, pizelles, and the funnel cakes of modern carnivals. Some vendor foods were not cooked, such as cheese and apples or pears sold from trays.

Taverns flourished because they filled a community need. Because housing was so cramped, it was almost impossible for many medieval men or women to invite friends to their **houses.** Wealthier people had larger homes, so taverns belonged to the poorer classes. Neighbors and students gathered in taverns regularly to meet each other. Many business transactions among the middle and lower classes were settled at taverns. In some places, taverns

By the close of the Middle Ages, travel was fairly common, and inns had become important hubs. In this Italian inn, the travelers appear to be storing their weapons on wall and rafter hooks. A long table at an inn offered many places for strangers to meet and mix, but at the same time, it mimicked feast tables where sitting in a certain place indicated a man's social importance. Some inns ordered round tables to keep guests from arguing. (Castello di Issogne, Val d'Aosta, Italy/Giraudon/The Bridgeman Art Library)

were also tax-collecting stations; in Poland, some taverns were managed by law courts.

Because taverns were transient meeting places, they were frequented by troublemakers. Fights broke out in taverns, sometimes spilling into the streets and turning into riots. Students in **university** districts were infamous for tavern fights and riots. Playing **games,** with or without gambling, was very common at tavern meetings; medieval people played dice, and cards came into use by the 15th century. Public houses were good places to meet and remain anonymous, so prostitution was always close by a tavern, if not operating out of the tavern itself. Some tavern keepers were accused of hiring out their servant girls as prostitutes.

Cities took an interest in regulating the tavern business. Paris imposed a curfew on taverns to keep fighting and prostitution in check. London regulations declared that tavern keepers had to permit customers to inspect their **barrels.** Wine and ale sometimes soured or were served in dirty containers. Even home-business taverns were inspected for fair prices. There were regulation quarts and gallons, and every alewife, even in small towns, had to bring her containers in for inspection periodically. Even so, taverns remained crowded, dirty places of very dubious reputation.

Taverns did not offer lodging. In the early Middle Ages, few people traveled. Aristocrats stayed at friends' castles and manors, and lodging for poor people was very limited. In some places, private houses offered lodging for a fee but either did not mark their buildings as inns or used a simple signal like the branch that indicated a tavern. The lodgings in these early inns varied greatly, but most travelers could expect nothing better than a cot or a shared space in bed with other travelers or family members. Some monasteries offered guest lodgings, especially for pilgrims.

The 12th century saw an increase in **pilgrim** traffic, after the **Crusades** established hostels to protect pilgrims. **Roads** improved during the 12th and 13th centuries. The first real inns were along international pilgrim routes, but as more regional and local shrines developed, more inns developed. The medieval term for a place of lodging was more often a hostel or hostelry. Some hostels rented **horses,** and others just provided a stable for a traveler's horse. A full-service, large hostelry on a pilgrim route required a large house with a hall for communal dining, chambers and beds, a courtyard with **latrines,** and a stable.

An innkeeper lived in the same house and literally shared his rooms, beds, and supper with travelers. Most inns were run by a married couple with a small staff of servants. Supper was a communal affair, as depicted in the *Canterbury Tales.* The host ate with the clients; he had a legal interest in remaining with them as much as possible. An English law of 1285 made the hosts of taverns and inns responsible for what their clients did. It was in the inn's interest to keep everyone calm and friendly, to see that everyone was in bed

at a good hour, and to watch for suspicious behavior. Robbery, especially of horses, was common at inns.

When the guests went to bed, they were still in communal quarters. While some inns had private rooms, many medieval inns expected guests to share beds. A traveler could expect to sleep with at least one other person, and some inns prided themselves on very large beds that could be packed with whole groups. Some guests could even sleep crosswise along the feet. Since discrimination on the basis of wealth and social standing was normal in the Middle Ages, a higher-status traveler could expect the only private room, while a poor man was lucky to have space at the foot of a crowded bed.

The character of the host made the inn's reputation. The Host in the *Canterbury Tales,* Harry Bailly, was a respectable man who knew how to size up the needs and social standing of each guest. He took a leading role in directing conversation and preventing fights. An inn was considered good if it had no more fleas than usual, provided decent food, and still had the same number of horses stabled in the morning. In a bad inn, the food was dirty or spoiled, the beds were obviously dirty, and the innkeeper worked with a theft ring to make the better horses disappear.

See also: Beverages, Cities, Food, Games, Pilgrims.

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Thatch. *See* Houses

Tools

Basic hand tools have not changed much since antiquity. A few new tools were invented during the Middle Ages, and all were improved and specialized for various crafts. European workmen liked to tinker with and improve their traditional tools.

The development of tools followed the development of the blacksmith's art. Most farm tools were made of wood during the Carolingian era; only cutting blades were **iron,** because it was still very expensive. Iron-edged tools included spades, axes, scythes, and plowshares. Blacksmiths were generally located on estates, where they made **weapons** and horseshoes for the

knights. Making tools was a sideline. During the 12th century, there was a growing demand for tools as population and **cities** grew. Blacksmiths set up in towns and began focusing on civil uses of iron. In the later Middle Ages, iron became more plentiful, and more common tools, such as rakes, pitchforks, and shovels, could be metal.

Every profession had its specialized tools, and some tools, such as **embroidery** scissors, have left little evidence in the archeological or pictorial record. Scissors were in use, along with other specialized cutting tools like surgeon's instruments. Pictures of shoemakers and goldsmiths show some of the specialized knives, scales, and chisels particular to each profession. The greatest number of pictures through several centuries was devoted to the tools of the building trade. Many Bibles and prayer books chose to illustrate the story of how the Tower of Babel was built, and these pictures always showed lively construction sites filled with contemporary workers. Because of this, we have detailed knowledge of the tools used in construction.

Ditches, foundations, and all kinds of earth barricades and mounds were dug with shovels and spades. This was unskilled labor and could be done by peasants hired as day laborers. They used simple baskets and wheelbarrows to cart away the earth. Wheelbarrows shown in 13th-century pictures are similar to modern ones; they have a platform with a slight basket shape, a single wheel, two handles, and legs to rest the barrow on when stationary. Another carrying device was the pannier, which consisted of two long bars with a sheet of leather fastened between them. Two men carried the pannier heaped with stones or earth. For the heaviest loads, they used **carts** with two or even four wheels.

The signature building material of the Middle Ages was **stone,** although relatively few buildings actually used stone. **Castles** and **cathedrals** aimed at permanency and could afford the expense in materials, workmen, and time. **Masons** were general contractors for working with stone, from architects to rough-hewing in quarries.

Masons in quarries mainly used heavy mallets and hammers with strong chisels. The chisels were tempered by being reheated many times so that they would be stronger than any material they came against, but, even so, they had to be sharpened daily. Hammers could be pointed, a cross between mallet and ax. There were also stone axes, used to smooth rough-cut stone. Mallets and mauls beat against iron chisels and could have beechwood heads. Punches were like smaller chisels with pyramidal ends and were used to cut stone into finer shapes. For finer stone carving, masons used a variety of chisels, punches, and hammers.

Masons used squares and plumb bobs to make sure that lines were straight and edges were truly vertical. The plumb bob was a piece of lead shaped with a point and hung from a string; it always pointed to the earth and created a perfectly vertical line. Masons used compasses to draw true

circles on the stone and measuring staffs to get the correct rough sizes. They often sat on three-legged stools, measuring stone and fitting it with their wooden templates to get the right shapes.

Next to stone, **brick** was a favored material for castles, churches, guildhalls, and town buildings. Bricklayers relied even more heavily on the plumb bob to keep their wall straight; they also kept a straightedge and a level. A medieval level was a flat board with a wooden triangle built over it. A plumb bob hung from the apex of the triangle. When it pointed straight down at the mark, the level was sitting perfectly horizontal; if the plumb bob pointed to either side of the mark, the wall was not level. The bricklayers' other tools were for applying mortar between bricks. They had a mortar-mixing bin and a pick for mixing the mortar, a shovel, and a smaller bin for carrying the amount needed to the wall. Bricklayers used a trowel that was identical to modern mortar trowels and a hammer for knocking the bricks into better alignment. For carrying bricks, mortar, or stones, a carpenter's helper used a hod. The hod was a shallow wooden dish with handles; because it was carried on the shoulder, it was often filled while placed on a tall stool so that the carrier could easily stoop under to lift it up.

Although castles and cathedrals were usually built of stone, most **houses** and other buildings in England and France were made of timber. Carpentry was skilled work and was carried out with hand tools similar to those in modern times, before the use of electric tools. One notable omission is the screwdriver; screws were not yet in use.

Carpenters used at least four different axes, beginning with the basic ax for felling trees and a hatchet for smaller cutting. Broad axes were slightly curved and set their blades perpendicular to the handle, like hoes; they were used for shaping trees into square beams. Roofing axes were similar but smaller and were used to cut gutters into roof beams and do other tasks that required gouging out a hollow. The smaller adze resembled these but was used to cut mortices into beams.

Drills were also called augers or bores. They were operated with a long cross bar at the top, so the carpenter could turn the drill bit with two hands. A cranked drill brace was not invented until the 15th century.

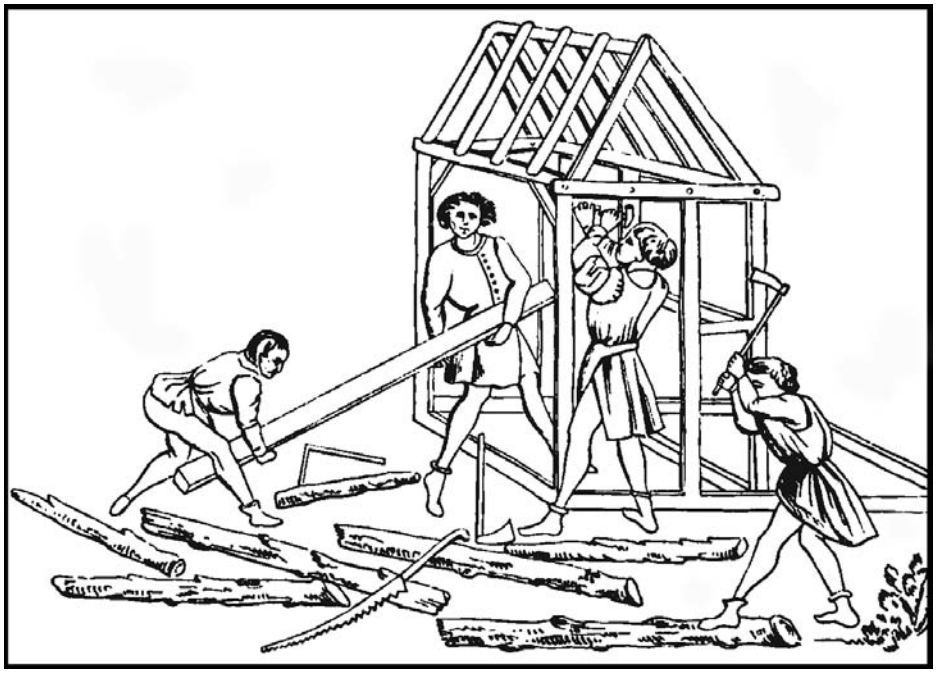
Blacksmiths made saws by cutting teeth into a plate of hot metal. There were handsaws, chiefly with thin blades held in tension in a frame, with a torsion rope at the top to keep the blade taut. These came in small or large versions for two men to use. Carpenters often used very long two-man saws with handles on both sides, especially when cutting a log into boards. Sawhorse trestles were part of their usual sawing kit.

Carpenters used a few more miscellaneous tools. Planes smoothed the square beams after they had been rough shaped by broad axes. There were files, made by striking a stick of iron with a sharp hammer to create ridges. Mallets and other hammers could be made of all wood or could have iron

heads. They used square iron nails and long iron staples made from thick bent wire.

The boom crane evolved from the simple use of pulleys to raise heavy materials to the level where builders were working. The simplest kind was a pole with an arm bearing two pulleys; a rope went over the pulleys and dropped to the ground. A simple lifting device like this was called a falcon or hawk. The real breakthrough in raising heavy blocks of stone came with a giant treadwheel. This large wooden wheel fit several men inside, and they walked to move the wheel; its power could lift much larger loads. To strengthen the frame, instead of a vertical pole with a horizontal arm, builders leaned a stout log against a shorter pole, forming a triangle on the ground with a tall diagonal arm leaning out. The windlass, or crank, came into use in the 15th century. Used with simple cranes, a windlass could lift heavier loads than a man's arms could pull on their own.

The crane could be used for lifting or pounding. It could be a pile driver that pounded logs into soft ground like nails to create a firmer foundation. In this case, the crane lifted a very heavy block of wood and then let it drop



Basic carpentry tools have not changed much over time. Even in a time of power tools, carpenters still depend on L-squares like the one sitting on the ground. These medieval carpenters are using axes and saws to square off tree trunks as usable lumber. While the building in the illustration is too small to be a real building, house size was limited by the length of local tree trunks. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

on top of the log. For lifting building materials up to masons, bricklayers, or carpenters, they used a basket or tub with handles, tied to a rope. Stone blocks were lifted with a clamp called a lewis. In some cases, the stone had a set of depressions chiseled into the top so that the tongs of the lewis would fit into them. In other cases, the lewis was shaped like scissor tongs and suspended from a rope. When it was clamped around the stone block, the pull on the rope exerted more pressure on the tongs to remain closed, thus gripping the block securely.

Workmen had to go up and down the unfinished buildings using ladders and scaffolding. The standing platform of scaffolding was usually made of wattle (pliant branches woven together) because it was lighter and cheaper. Scaffolding could be built up from the ground in the form of poles lashed together to support the platforms. Castle building tended to use built-in scaffolding, particularly for round towers. As the tower rose, poles were built into the walls going upward in a spiral. When the tower was complete, the scaffolding was removed, walking backward down and pulling the poles out of the wall. Some towers still have these holes, and some still have pegs or poles that were left in case they were needed later for repair. The least common kind of scaffolding that was necessary in some cases was a hanging wattle platform, suspended from a crane or tower to lower workmen to the building site.

Medieval workmen used only one kind of safety equipment. When they were working at great heights, installing stone blocks for a vaulted ceiling, some tied a rope around their waist and secured it to a column. Not everyone did this, and it was the only safety measure known. Work accidents were as routine as accidents in other areas of life.

See also: Castles, Cathedrals, Forests, Houses, Iron, Stone and Masons.

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Tournaments

The festival war games called tournaments first appear in the written records of Northern Europe around the year 1100. Real wars were at a lull;

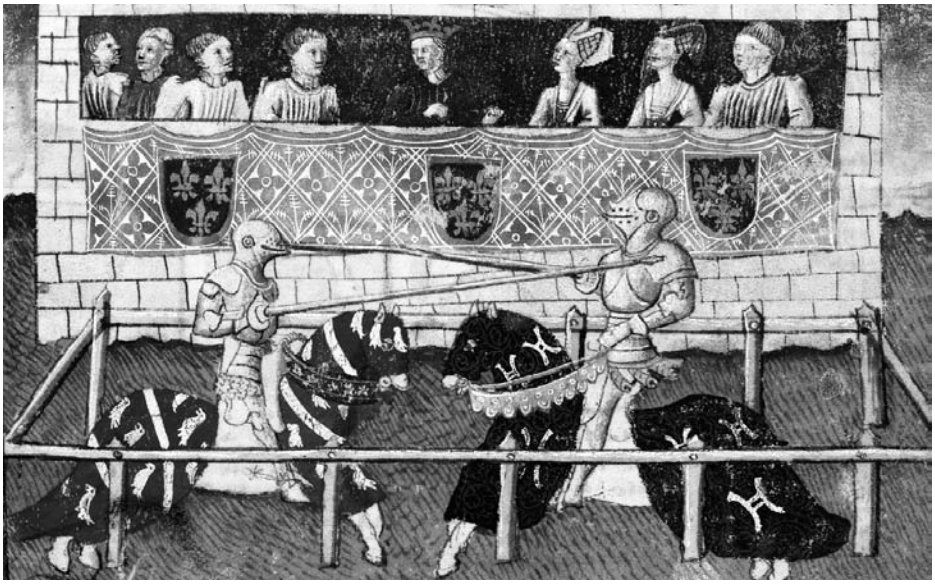
the barbarian Vikings and Huns were no longer a problem, and the Hundred Years' War between England and France had not yet begun. The First **Crusade** had been launched in 1095, but many **knights** had returned home, bored. Tournaments provided employment and entertainment for those not on Crusade. The object of a tournament was to capture, not kill, the opposing fighter. Losing knights paid ransoms to winning knights, which made tournament skill a possible source of income.

Since the time of Charlemagne, knights had sometimes staged mock battles for training. When there was no war, young knights had to be toughened up by facing danger and being injured. Tournaments made training into a sport. During the 12th and 13th centuries, the main feature was a large mock battle, the melee. Far more than any other sport, tournaments were violent and caused severe injuries. Knights went into the field as well armored as they were in battle, and although they often used blunt **weapons,** the violence was still savage.

Tournaments, unlike war, had strict rules. There were judges and heralds to register (or disqualify) all invited and uninvited participants. There were fenced zones where injured knights were safe from attack in a melee. These may have been originally called the *lists,* a word that later came to apply to the jousting field itself. It was a foul to aim for the other knight's horse; the result was disqualification. One knight was chosen as a field referee, called the chevalier d'honneur. His lance had a headscarf pinned to it, and he could go to any knight in distress and touch him with it, disallowing any further attacks. A melee could continue only until the president of the tournament, the official in charge, decided to throw down his warder as a signal to the heralds. Then the heralds' trumpeters sounded retreat, and the fighting had to stop.

When a knight unhorsed his opponent, he claimed the loser's **armor** and **horse.** The loser nearly always ransomed them back; if not, the winner could keep or sell the equipment. Ransoms were fixed in advance; the price rose with a knight's rank. In this way, a poor but talented knight could become wealthy by playing the tournament circuit. Knights errant, who came from noble families that had lost their wealth and land, earned a living by jousting. Tournaments were a very expensive game for those who were not as talented; the average knight only entered the lists to the point that he could afford the losses. The biggest loser in a tournament would be a high-ranking nobleman, such as a count or even a king, who was a poor contender and only incurred losses that cost him high ransoms.

Tournaments always offered prizes, paid for by the sponsor or by aristocratic spectators, usually ladies. The most common type of prize was an **animal,** such as a dog, a falcon, a bear, or even a sheep or a large **fish.** Tournament **records** also tell us that some prizes were gilded statues of animals



By the 15th century, tournaments had become more sport than war training. Everything was formalized: the spectators had sheltered seats and included fine ladies, and the joust only took place in a guarded area called the lists. Each contestant and some of the spectators can be identified from his heraldic symbol; the artist did not need to add names. Although the lists were enclosed with a low fence, the area must have been much larger than shown here. In many later tournaments, the jousting knights were separated by a low wall that kept them in lanes. (Royal Armouries/ StockphotoPro)

like deer, falcons, or horses. It is possible that the ladies who sponsored the prizes acted as judges. The tournament always closed with a **feast** at which the winners were honored at the high table.

Knights who made a habit of attending most tournaments in a circuit across France, Flanders, and England traveled many miles with large retinues of **servants** and horses. When a band of knights traveled together, each with his spare horses, pack animals, squire, and other servants, the group was not only large but also rowdy. They were a notorious roadside hazard to other travelers, with whom they were too eager to get into quarrels. At times they robbed less powerful travelers. This tendency of knights to use their power too freely was a primary motivator of the code of chivalry, which insisted that they must never rob, rape, or bully a weaker party.

During the 12th century, the kings of England and France, and some other ruling lords, opposed tournaments as violations of their decrees of peace. Counts and princes who liked the danger and excitement of tournaments continued to sponsor and organize them, often at outlying fields on

the border of two realms. The "Young King" Henry, son of Henry II of England and Eleanor of Aquitaine, was a big sponsor and participant in international tournaments. He kept a team of knights as paid staff to fight in melees and paid the ransoms when they lost. Aggressive, free-spending aristocrats of this type made the tournament the first-ranked interest all across Northern Europe. There were cases of bored knights in besieged towns or castles challenging the besieging army to a tournament outside the walls. In most cases, both sides respected the rules, and then went back to their war stations when it was over.

The **church** at first opposed tournaments as festivals of pride and vice and as opportunities to sin by killing, even accidentally. If a man died in a tournament, he was considered a suicide, since he had put himself in harm's way. Some bishops excommunicated tournament participants, but wealthy knights bought their way back into grace by giving alms or donating land to the church. Tournaments were so popular among the nobles of England, France, and Germany that the church's opposition made no difference. People loved tournaments, where courage and skill could be seen close up without the danger and confusion of a real war. By the time minstrels were circulating stories of the Virgin Mary disguising herself as a knight, moral opposition had no effect, and the church stopped opposing tournaments.

Aristocratic **women** came to tournaments as spectators. By the 12th century, their role in public had changed, and the new spirit of courtly love encouraged knights to fight better to impress the women. Ladies chose champions and gave favors and were prominent guests in the viewing stands. Some ladies learned to joust, and by the 14th century, when knights began to come in costumes, some ladies came costumed as men. Their **clothing** fashions were also influenced by **heraldry**; the cotehardie often bore embroidered heraldic arms so that the ladies could attend the games dressed like modern sports fans, in team colors. A few bold ladies grew so infatuated with tournaments that they began traveling from one to the next, instead of attending only those closest to home.

Tournaments filled nearby towns with participants, spectators, merchants, craftsmen, and horse thieves. When a knight could find a **house** to rent, instead of staying in the field in his tent, his squire hung his banner or shield in the window of the rented rooms. Local **castles** and manors permitted friends and other participants to stay, and visiting kings generally stayed at these castles, rather than in tents. In the tournaments where towns served as headquarters for regional teams of knights, halls and kitchens were rented for receptions and feasts. There was usually a trade **fair** associated with a tournament, and merchants and craftsmen for tournament-related business set up booths. Some armor makers became itinerant armor menders, following knights on the circuit. The event was also a big opportunity for local merchants to sell more **food** and other provisions.

The nature of tournaments changed during the five centuries when they were popular. Early tournaments of the 12th century had both single-combat challenges and a mock battle—the melee. In single-combat challenges, unhorsing the opponent meant victory and the right to claim a ransom. In the melee, the knights were assigned to opposing armies, and they charged each other at a given signal. Although the object was to capture opponents, many knights were seriously injured or killed in melees. In early tournaments, the mock battle was not formalized or confined to the field at hand. A group of knights could veer off the field and chase into nearby woods or fields. These large mock battles brought out hundreds of knights, and some large 12th-century tournaments claimed to have more than 1,000 participants.

The 13th century may be considered the height of the tournament. Each event, now formalized with traditional rules, lasted about a week. The knights began with some days of practice jousting, and then held formal jousting challenges. While the original meaning of a joust was any kind of single combat with any weapons, by the 13th century it meant only the combat when knights rode against each other with lances. Fights could be to the death (or until injury or surrender), or they could be just for points, like a game. If the lances and swords were blunt, they were called "arms of courtesy." After a day of rest and paying ransoms, the knights chose sides for a melee. The mock battle was held in a more restricted area, a field rather than the general countryside as in the previous century. The last day was for feasting, dancing, and **minstrel** performances.

In the late 14th century, tournaments began to have as much pageantry as warfare. In some English tournaments, the knights wore costumes onto the field. They fought as monks or even as cardinals. At the opening day of another tournament, the knights paraded onto the field, each held with a **silver** chain and led by a lady on a horse. In a French tournament of the middle 15th century, the participants dressed as shepherds. There was a trend away from full armor and real weapons; some places ruled that only partial armor could be worn, and even squires could not bring so much as a dagger.

By the 15th century, tournaments had completely changed. There were no dangerous melees, and the single combats were very formal and stylized. Battlefield fighting no longer used lances, so training with a lance was only for a tournament. Armor had become very heavy, as it was made entirely from plates of metal. It was less necessary and more ceremonial, often covered with decorative etchings and used mostly in parades. Horses were larger and slower, and saddles were improved to the point that knights could not always be unhorsed. Knights rode against each other with a low wall, called the tilt, between them. Contestants won on style points given by judges.

Tournament Equipment

During the height of the tournament's popularity—the 12th and 13th centuries—chainmail hauberks were the usual armor. There were also tournament-specific fashions. Some knights wore peacock feathers or fluttering ribbons or straps on their armor, and knights at tournaments always wore the most colorful fashions in surcotes. Squires wore lighter armor, such as padded tunics and lighter hauberks called haubergeons. During the 13th century, squires began to dress more like knights, and knights wore ever more elaborate attire.

In the 14th century, the development of plate armor for the battlefield brought it into the tournament. From that time, tournaments drove the development of armor as much as war. Horses did not need armor in a tournament, but plate armor for the horse's chest developed in response to pike warfare. Equine armor looked impressive and was very expensive, so in the later tournaments of the 15th and 16th centuries, it was often used.

By then, the knight's tournament armor had diverged from war armor. It had lance rests built in, and the side turned toward the oncoming lance was more heavily padded and plated. Special plates deflected lance blows at points of frequent contact. Some regions developed padded leather shock absorbers. Tournament armor by the end of the 15th century was not unlike a heavily padded football uniform. German armor makers had become dominant in Europe at this time, so the German tournament style also became dominant. It was heavy, expensive, and extensively decorated and gilded. By the 16th century, tilting armor had become highly specialized.

The helm developed for tournaments by the 15th century was impractical in war. It was pointed in front to deflect lances, and the entire face was covered. A slit permitted the knight to see only in front of him, and only when his head was tipped forward. In a single-combat joust, the knight could focus only on the threat in front of him.

A lance used in a tournament was different from a lance used in war. It had no sharp point; instead, it had a blunt end with three iron fingers sticking out to allow the knight to push on the other knight's armor and throw him from his horse. Originally, the shaft of the lance was just a 14-foot pole, but by the 15th century, the grip end had been specially designed for tournament use. The knight's breastplate had a bracket riveted to the right side to help hold the heavy lance. The lance was thicker at the handle end to transfer the center of gravity back toward the knight's hand. The handle had been carved out of this thick end, so the thicker part formed a guard for the hand.

The lance was held under the right arm, against the body, which made it cross over to the left side of the horse's neck, sticking out in front. The knight aimed at his opponent's head or body, and he had to hold the lance

The late-developed helmet for jousting was very impractical for real warfare. In a tournament, the knight knew exactly where his attacker was and could sacrifice visibility to face protection. He could only see out through the slit when his head was lowered to charge. (Royal Armouries/StockphotoPro)

as firmly as possible, pointing straight forward. At the moment of impact, he rose in his stirrups and pushed forward with his body's weight. At the same time, he had to duck or deflect his opponent's blow.

The knight's tournament saddle had a high back and a high, wide pommel called a burr plate. Even more than in battle, in a tournament the oncoming lance could slip and strike the knight's saddle or leg. Since the point of jousting was to remain in the saddle, it held the knight with great stability. Stirrups had to be very strong, and they were designed to avoid trapping a knight's foot, in case he did fall.

Tournament weapons became increasingly ceremonial as the Middle Ages passed. Blunt swords used as arms of courtesy could still hurt someone; at times, whalebone swords were used. With whalebone swords, leather armor was adequate. A combat of this type was truly sport, rather than war.

With the increase of pageantry and show over the centuries, tournament equipment included heraldic flags, caparisons for the horses, surcotes, and tents. A knight needed many wooden lances and at least two swords and shields. He needed at least one spare horse. His squire stayed in the tent with him and helped him dress, and they needed their supplies for the week. Additionally, both knight and squire needed fine clothes for the final banquet.

See also: Armor, Feasts, Heraldry, Horses, Knights, Weapons.

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Toys. *See* Games

Troubadours. *See* Minstrels and Troubadours

U

Unicorns. *See* Monsters

Universities

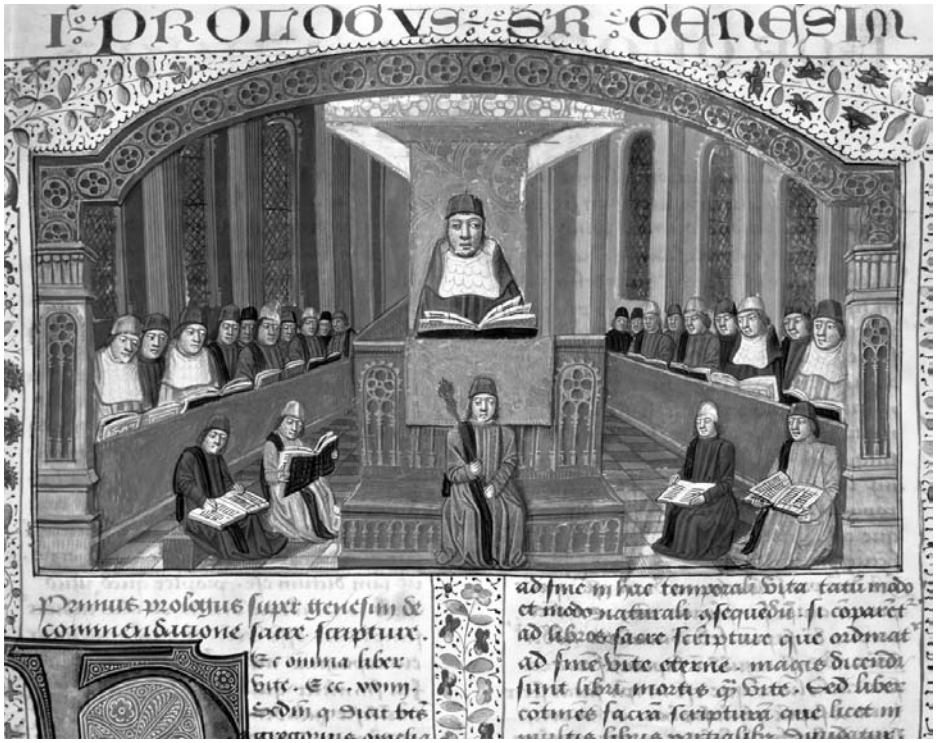
In medieval times, a center for advanced study was called a studium. Students, who already could read and write Latin, listened to lectures in Latin. The entrance exam was typically a test of ability with Latin. Students studied the liberal arts curriculum of rhetoric, mathematics, and grammar. Rhetoric was the main field of study, as they studied arguments and philosophical questions. After the main course of study had been completed, students could choose to study **medicine,** law, or theology, depending on the strengths of each university.

The first university was at Bologna, Italy, and its specialty was the study of law. Next were Paris and Oxford, both centered originally on theology as well as law. Paris and Oxford were under **church** oversight, while the university at Bologna was independent. Medical schools could be independent of universities, as at Salerno, or they could be part of a larger institution, as at Pisa and Milan. By the 14th century, most **cities** had a university.

The bedellus in a medieval university was the official responsible for keeping classes running, like a modern dean. In Paris, a teacher was called magister, while in Bologna, he was called doctor. Although university scholars did not have to be ordained clergy, they were often in orders. If they were not, they were expected to live as monks and devote themselves only to learning. The Dominicans and Franciscans came to dominate teaching in the universities during the 13th century.

Lecturers at early universities were paid directly by students, who contracted to hear them lecture on their specialty subject. The word *university* came from the Latin expression for associations of students and teachers, *universitates scholarium* and *universitates magistorum,* who used collective bargaining to negotiate the terms of study. Students demanded that teachers meet certain standards, such as being in class on time and not lecturing past quitting time. At Bologna, they forced the masters to promise to start and end their lectures on time or pay fines. Instructors were required to cover the promised curriculum, and they could not be absent without permission from the students. On their side, teachers demanded standardized fees. These collective-bargaining associations became the name of the institution whose customs they shaped: the university.

General university subjects were logic, rhetoric, **music,** astronomy, arithmetic, and geometry. Logic received the most attention; it expanded to include all the works of Aristotle, which included studies of science and ethics. A standard method of teaching was an oral debate over a question proposed by the teacher. The students took part in the debate and based



University lectures were often given in much simpler rooms than this fine paneled hall at the Sorbonne in Paris. The format was generally the same all over Europe: a lecturer spoke in Latin as students studied the text and took notes. Debates provided the only variety. (© Glasgow University Library, Scotland/The Bridgeman Art Library)

their arguments on their reading. An opening topic might be, "Whether lightning is fire descending from a cloud." The first stage consisted of arguments to the affirmative, called the principal arguments. Then other students (or the teacher) provided arguments to the negative, contradicting one or more of the principal arguments, and usually citing an authority such as Aristotle. The format allowed university students to hear their study put to use and to sharpen their wits about how to reason and debate.

In order to produce textbooks for the students, the university sent work to outside copyists. After the professors created an exemplar of a short text, private copyists, including educated women, made copies by hand. These simple copies, called in Latin *pecia,* could be made quickly and inexpensively. Students could buy or rent them. Because these short **books** were intended for student use, they were unlike any other medieval books and much more like modern ones. They had wide margins for taking notes in class, and they divided the text into paragraphs and red letters (rubrics)

that broke up the text. They also put spaces between words to make them easier to read.

Completion of the general university course took between 4 and 6 years. After this, students could study law, theology, or medicine. Each university developed a specialty. Theology was the specialty of Paris, to the deliberate exclusion of other graduate studies, so that theology students would not be distracted. The university at Bologna had a medical school that allowed students to witness the dissection of cadavers, but medical students at Oxford did not witness dissections. Many medical faculties at universities did not incorporate patient care, but required only memorization of standard texts. A medical degree might be earned in 8 years, while a theology degree required at least 12.

On completing the degree, the student had to apply to actually receive it, and this application cost a substantial fee that provided a great part of the university's funding system. Some students could afford to attend the university, but they could not afford to graduate. The most common title granted on graduation was "master." This title permitted the graduate to teach. "Doctor" also indicated "teacher" and was used in some universities as the teaching title. It was gradually applied to physicians, since they were very learned.

The organization of colleges within a university came about as a solution to housing for students who were often as young as 15 and were far from home. A college was a small community to support these students' living needs. Many of the first colleges were endowed by a patron so that the students enrolled there would say prayers for the patron's soul; the college provided room and board in exchange. These early colleges often gave preferential acceptance to poor relatives of the founder, and some began to require work, as partial payment, from the poorest students. The Sorbonne began as a charitable boarding house for poor theology students and only later added teachers to become a real college. The colleges of Oxford began similarly.

By the late Middle Ages, colleges maintained a cook and a laundress. A manciple oversaw the college's operations, and larger colleges began to employ tutors to help their resident students. As books were donated, colleges built up **libraries.** College rules helped regulate student behavior; since most students lived at the college free of charge, the college could require attendance at Mass or at university lectures, and it could expel those who were too unruly. Students who lived on their own could easily turn into petty criminals or vagabonds, so the college system of organization helped make university study respectable again. By the end of the period, some students were paying to live at colleges, but it was considered more of an honor to have been admitted for free, on merit. The colleges were the first real dedicated buildings at most universities, which generally

rented their lecture halls and only built or purchased buildings after the Middle Ages.

Students were typically unruly. They considered themselves to belong to the university, rather than to the town. They insulted students or travelers of other nationalities and got into violent fights. They gambled and drank. It was unclear whether they had to obey the town's laws or whether they were answerable only to the university. When a student occasionally committed a violent crime, the town and university came into conflict. At Oxford in 1355, a fight at a tavern led to a riot the following day in which some students and townspeople were killed, and some college buildings burned. The usual redress for these riots was in favor of the university, since the kings had a keen interest in keeping the universities open. It was easier to discipline the town.

During the medieval period, many masters and lecturers began to wear distinctive robes and **hats** to show their academic status, just as other professions and **guilds** had distinctive clothing. The robes and beret-like caps were originally identical or similar to the robes and caps of the clergy, since many of the lecturers were monks. The variations on these robes and caps through the late Middle Ages and Renaissance became the modern cap and gown of graduation. At the University of Paris, by the mid 14th century, doctors of theology wore black robes, often with matching hoods. Doctors of law wore red robes with wide sleeves. At the Italian universities, scholars wore red robes edged with miniver fur.

See also: Books, Medicine, Music, Numbers, Schools.

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W

Wagons and Carts

The most ancient form of **animal** transportation, which was used all over medieval Europe, was the pack. **Roads** were often no better than narrow paths, and where **bridges** existed, they were rarely wide enough to allow a wheeled vehicle to pass. Most farm products and peddled goods were moved in packs on oxen or mules. Wheeled vehicles had been used in Europe since Roman times, but they only expanded in use as roads improved. During the early Middle Ages, the old Roman roads decayed; new towns and **cities** did not build good roads, but allowed paths and tracks to widen into dirt roads. Wheeled transportation increased, but it was never as important as shipping by water during the period. Its importance was mostly local and personal, in the form of simple carts. There were always places where wheels were impracticable. In winter, or in very steep places where more friction with the ground was helpful, sledges were also used.

By the Middle Ages, the wheel had developed into the stable form still in use today for many farm carts. Spokes made of oak attached to an elm hub, also called a nave or stock. The spokes were hammered into curved beech or ash pieces called felloes, which fitted like puzzle or arch pieces into a wheel shape. In the earliest wheels, thin wood pieces called strakes were nailed around the outside of the felloes to form the rim. Additional nails, left sticking out a bit, could give the wheels more traction. After **iron** technology became common, iron rims were standard. A band of iron ran around the outside rim; it was applied while hot so that it would shrink as it cooled and create a very tight fit. All through the Middle Ages, the earlier technique of nailing wooden strakes around the wheel remained very popular. A farmer or carter could repair this wheel himself if needed.

Wheels properly attached to a cart or wagon were set at an angle, called dishing, to counterbalance the swaying of the animal's movement, the shifting of the load, and especially the uneven road surface. The axles were set so that the top of the wheel leaned away from the cart. Early axles were made of oak and attached the wheel with a wooden linchpin. Iron axles were stronger than wooden ones and replaced wood in more expensive and durable carts in the later Middle Ages.

Harnesses for both carts and wagons were most often made of leather, but they could be made of **cloth.** The most expensive piece of the harness was the **horse's** collar, which had a wooden framework inside the padded leather covering. Halters, traces, girth straps, and occasionally saddles made up the rest of the kit.

The first form of wheeled vehicle was a two-wheeled cart. During the Middle Ages, the two-wheeled cart was much more common than the four-wheeled wagon. Two wheels sufficed to carry the load, and a two-wheeled cart was easier to maneuver on a deeply rutted road or track. They could be

used with an ox, a donkey, a small horse, or even the peasant's own muscle power. Additionally, a two-wheeled cart easily acted as a dump truck. Carts could haul manure, hay, or wood, and if the cart was unhitched from the animal at the destination, it tipped back to dump the load. No medieval carts have survived into contemporary times; the cart was a working piece of equipment that remained in service until it fell apart.

Two-wheeled carts were able to manage all but the heaviest farm loads. For hauling hay or grain at harvest, a large cart could be loaded heavily and hitched to more than one ox or horse. The cart's shafts connected to the closest horse, with one or two horses in front, their heavy collars connected by ropes to the shafts. The heaviest, largest carts were called *plaustra* in Latin and may have been used primarily with oxen. They were heavily loaded with hay but still had only two wheels.

Carts acted as common transportation not only within farms and villages, but also from the farm or village into the market town or city. Two-wheeled carts carried the majority of goods to and from the point of sale. Carts carried into cities loads of charcoal, cheese, bread, nuts, **pottery** jugs, candles, firewood, and flour. It is hard to name any commodity that was

Two-wheeled carts carried most farm products around Europe, since they were cheaper to make and easier to maneuver on turns. The picture shows a heavy covered cart turning to go up a hill. The horsepower is not quite sufficient and a team of farmhands must help push it and keep its load from falling out. (The British Library/ StockphotoPro)

not carried by carts, which hauled **water,** manure, rubbish, gravel, chalk, lime, building **stone, brick,** timber, and all kinds of produce and manufactured goods.

Carts were as often hired as owned. Farmers owned carts, as did manufacturers who used them for transport every day, but most people in a town did not. Just as horses could be hired, so could a cart and ox. Royal officials could often press private carts into service at a moment's notice. Some carters also made regular journeys between large towns and cities, carrying packages and goods for people who did not transport things enough to warrant the use of a whole cart. These private carriers operated as a regular parcel delivery service.

Carts required frequent upkeep. Wheels and other parts had to be lubricated regularly, and about every year, the axle wore out and had to be replaced, particularly if it was an old-fashioned wooden axle. A heavily used cart ran through two or three sets of wheels in a year. Depending on its use, the body of a cart lasted a year or two before it needed to be replaced or fixed.

A wagon is, by definition, a box with at least two axles and four wheels. Wagons were common on the European continent during the Middle Ages, but not in England. Many of England's roads were inadequate for wagons until the 16th century. Wagons were a greater financial investment; a wagon cost more initially than a cart, and it required the upkeep of four wheels and two axles. It was used to pull heavier loads and usually needed multiple oxen or horses, a further expense. Wagons were used for heavier, longer distance transport, such as moving household goods over long distances. When nobles traveled between their **castles** and manor **houses,** they used wagons to move their **furniture** and supplies. They were called *currus* in Latin household **records,** which became *car, char,* and *charet* in 15th-century English. Wagons were more expensive and less common and were less likely to be worked until they fell apart, so a few old wagons have survived.

During the 12th century, wagon technology took some steps forward. First, the oxen or horses were connected with a set of double shafts (wooden poles) around the animal's body. The double shaft attached to the horse collar or oxen yoke so that the animal's shoulders pulled equally on the load. In the next stage, the shafts were connected not to the wagon directly, but to a whippletree. The whippletree was a bar in front of the wagon; it received the direct pull of the animals and was connected to the wagon at only one point. It was mounted on a pivot so that the animals could turn and the wagon would follow.

Next, the development of an undercarriage that could turn the front wheels made wagons much easier to use but harder to build. The front axle had to be mounted on its own framework that was independently attached

to the wagon, although the rear axle could still be attached directly to the wagon. The front axle's assembly pivoted on a tough oak or iron pin.

It is unclear whether the pivoting front axle was in use all through the Middle Ages. Some scholars suggest it was an innovation around the 13th century, while others believe it had been a standard part of wagon building since Roman times. Pictures are ambiguous; when a shaft or rope in an illustration is attached to the base of the wagon (or more clearly to the axle, not the wagon box), it is possible it is showing a pivoting front axle. Some illustrations portray a wagon with both axles fixed and the horse's shafts directly connected to the wagon's box. It may be that both kinds of wagon were in use.

Manuscript illustrations that show carts and wagons rarely show them with solid wood bodies. Wood was expensive, so it was only used for the parts that had to be structurally sound. The sides of a typical cart were often made of wattle: vertical poles, with flexible branches woven between them. The sides could also be made of vertical poles held together at the top by a horizontal bar, like a cage. Solid wood boxes were only built if the load was heavy, such as root crops, stones, or **coal.** Taller poles could be added to transport a tall load, such as hay.

Kings and queens traveled from manor to manor either on horseback or in coaches. Some records tell the splendor of these specially crafted wagons. They were roofed with rounded hoops supporting a canopy, and they had seats with cushions. The walls were covered with linen at the least, and more often with silk. The rainproof covering was sometimes made of canvas coated with wax. The interior was as splendid as the royal family's status and wealth could manage: silk velvet cushions, **embroidery,** diamonds, and gilding. The exterior was brightly painted, with heraldic coats of arms.

By the 14th century, and perhaps earlier, some wagons had frames that suspended the covered box on leather straps or chains so that it swayed instead of jolting with the rough road surface. In Latin household records, this was a *currus mobilis,* a "moving" (swaying or swinging) car. French records call these vehicles chariots. An even-gentler way to travel was the litter, a carriage box without wheels that was suspended between two horses. Litters were used only for royalty.

The wagon's most unusual use was in the seasonal dramas put on by English city guilds. Specially designed wagons served as portable stages that moved through the city and stopped at scheduled intersections and squares. The wagons had platform stages, walls to serve as backdrops with painted scenery, and special features like trapdoors, curtains, and upper stories. Some even had lights or fireworks. Each guild that put on a stage of the larger drama invested a lot of money and work in their unique stage wagon; the wagons were used only once a year and lasted for many years'

Aristocratic women on long journeys used covered wagons pulled by a team of horses. These wagons were padded and decorated to make them clean and comfortable for the ladies, but little could be done to improve the wagon's suspension and the bad roads. During the Middle Ages, some wagons began to have simple suspension systems so that the wagon box rocked instead of jarring, and most had wooden shafts to hitch the teams to. It is hard to tell if the harnessed horses were sometimes attached to the wagon box with only ropes, as in this painting, or if such drawings showed the artist's ignorance and lack of a real-life model. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

use. It seems likely that some traveling jongleurs had similar wagons for their shows, but only the city guild wagons have survived in historical records.

See also: Agriculture, Bridges, Drama, Horses, Roads.

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Washing. *See* Hygiene

Water

Most human settlements are planned around a water supply; people settle at the mouth of a freshwater stream flowing into the sea or at a good ford across a river. Some settlements are not made with regard to water, or, as they grow, they outstrip their local water supply. The problem of finding enough clean water began to be a pressing problem for medieval settlements in the 11th century.

Although medieval people had inaccurate ideas about what caused disease, they felt strongly that bad odors were unhealthy and that cloudy water could not be good to drink. They did not think of boiling water as a way to purify it, even if boiling water was their normal cooking method. Water was not a chosen drink; monks only drank it to mortify the flesh, and it was too often impure to be considered a good drink. It was also the drink of **beggars**; drinking water was a social shame. Water could be improved by adding wine, vinegar, or **spices,** but it was still barely acceptable. But water had to be used in cooking, brewed as ale, and mixed into wine, so it had to be pure.

Former Roman provinces often had aqueducts to bring water from mountain springs. In the fall of Rome, many aqueducts were torn down, but some continued to bring water into the city. Aqueducts in Britain fell into disrepair quickly, but some in France, Spain, and Italy continued to function for several centuries. These communities had an advantage in developing new water systems, but water technology spread through Europe mostly through **monasteries.** Benedictine and Cistercian monasteries developed most water-system technology.

Monastic Water Systems

Medieval European monasteries were known for their well-planned water supply systems. Some monks altered a river channel to bring water to their compounds. They usually had to line such channels with **stone,** and some channels were covered in stone to keep the water clean. Many monasteries dug deep trenches and laid up to three miles of pipes to bring water from a nearby river or spring. Springs were preferred, and usually a springhouse was built over them to keep them clean. Usually several water sources had to be tapped and collected into the main pipeline.

Italian monasteries could sometimes make use of old Roman aqueducts, but in Northern Europe, they had to use underground pipes. The pipes were most often made of **lead,** but some were made of **pottery,** and a few

were hollow tree trunks. Since Roman pipes had all been lead, nobody yet suspected that lead was poisonous.

Bringing water from afar was not a simple task. The water had to flow steadily downhill, since gravity was the only engine for water flow. When a stream or spring at a higher elevation had been located, it was often on someone else's land, and the proposed conduit would cross many lands. These conduits could have been entirely in rural land, or they could have crossed under a town wall, under streets, and into the friary or abbey. Monasteries had to get permission or buy the strips of land they needed to dig. In order to maintain the conduit's steady downhill gradient, ditches to bury pipe varied from a few inches to 24 feet. The ditches had to be lined with stone or clay and the pipes carefully joined with molten lead, tow, or **iron** collars. When conduits came to other ditches, creeks, or **roads,** they had to go over or under; some pipes ran along **bridges.**

When the pipeline came to the monastery, there was sometimes a series of settling tanks to allow dirt in the water to settle before the water was ready for drinking. The water system brought supplies into many of the buildings. If the pipes were narrow and watertight, there was often enough water pressure to feed a fountain. Fountains were the preferred water distribution method in the Middle Ages. They looked and sounded beautiful and peaceful, and they made water available to many people at once. A monastic lavatory station could be a water fountain with a dozen spouts so that many monks could wash at the same time. Other fountains were set up for filling jugs by dipping them into the reservoir.

The reservoir of the fountain drained into pipes that carried the water away to other buildings and rooms. Monasteries without fountains had cisterns and reservoirs filled by the pipes that formed an underground river. Pipes went to the dormitories, the kitchen, the workshops, and the washing stations. Washbasins, called lavers, were made of stone, bronze, or lead. The water came into laver stands through pipes with **copper** taps on the end, which were sometimes shaped like animals' heads. The water could be turned on and off by a stopcock faucet in a circular socket. Water flowed if the hole in the stopper aligned with the hole in the pipe but was stopped if the stopper was turned so the holes did not align.

Secular Water Systems

In rural places, springs, wells, and rivers supplied water. Medieval wells were nothing more than holes dug down to the water table. Later wells had walls around them, roofs, and windlasses to pull buckets up. In the Middle Ages, most did not, and many accidents occurred. Older children and **women** were the most common water carriers. They could lose their footing at the well's edge and fall in, and many drowned. By late medieval

times, many **cities** passed ordinances that wells needed walls, windlasses, and clean **buckets.** In the country, they rarely did. Some wells were not clearly visible, and strangers fell into them in the dark. Without protective walls, wells could be contaminated by spring flooding, and they also became even more invisible.

In medieval Italy, rural cisterns were more common than wells. Rain fell, but it had to be collected for later use. The roof channeled water through the gutters into the cistern. Cisterns were stone lined, and some were large enough to serve several families. In particularly dry places where spring or cistern water was scant, dirt or sand could be used to clean dishes or tools.

Castles always had wells as part of their defensive planning. In case of a **siege,** the castle could not be left without water; piping water from the outside was not an acceptable solution. Typically there was a well in the courtyard and another within the keep itself. This well had a shaft built over it so that a bucket could be lowered into the well from any floor of the keep. As castles modernized and became less centered on the keep, the well was often built into a building that served to pump the water into a high tank, where it supplied pipes going to different buildings. Many castles were near

Perugia's medieval fountain still stands in its old public square, although it is now fenced off. It was the main water source for most of Perugia's residents in its time. The round design allowed many people to dip pitchers into the fountain's basin or hold them under one of its many spouts. Italian cities had the best public water systems of the Middle Ages. (Francesco Remolo/Dreamstime.com)

larger water supplies like rivers or lakes; barrels could be filled there for large-scale water uses.

Medieval **cities** usually grew around a water supply, most often a river or large stream. The river allowed the people to travel easily, often to the seacoast for trade, and it also gave them a supply of water. Within the city walls, there were sometimes natural springs with public wells built over them. Citizens and neighborhoods also dug wells all over the city so that they could get their water nearby. As long as the towns were relatively small, they could count on their water supply. The problem was that as they grew, they also used the rivers for carrying away waste of all kinds. When there were more cities along the same river, the water became polluted. Within the city, the wells could not always stay clean, since latrine cesspits allowed sewage to leak into groundwater.

Industry increased the need for water. Some industries, such as ale brewing, were inherently water based, while others, such as tanning, dyeing, and laundering, depended on water for large-scale washing. These tradesmen needed **barrels** full of water, and while some could use polluted water, many could not. Other industries used the river heavily for sanitation; this was especially true of butchers, who wanted the river to carry away the blood of the animals they slaughtered. Tanners also were among the heaviest polluters. Cities began to face water shortages for both businesses and residents.

The problems were compounded by the never-ending need to build new housing and workshops. Many cities that originally had tributary streams feeding their major rivers needed to build over them. Smaller streams silted up, and others were encased in underground pipes so that whole streets could go over them. When a city had a great river flowing through it, over the years its embankment became a solid wall of docks, wharves, and houses. Cities like London and Paris built public access points, wide stairs that permitted the public to access the river. People drew water for their cooking and washing, and nearby there was usually a public **latrine.** It was an outhouse that dropped waste directly into the river.

By the 13th century, medieval cities needed to bring in a lot of water from outside the city. The countries in the old Roman Empire, particularly in Italy, inherited aqueduct systems and even some city sewers and plumbing. Public fountains were standard in Italian cities from an early time. Northern Europe's cities had no existing infrastructure for water. They used lead pipes and the hollowed trunks of hardwood trees like elm to channel river and spring water from outside the city walls. In some cities, the local monastery's system provided the basic piping, and the town used its overflow capacity. When a city's water needs outstripped its supply, the city or private vendors brought water in casks and carts from rural springs.

Italian towns had at least one large fountain, and often several. The water fell down in multiple spouts into a reservoir, so users could fill pitchers at a spout or dip buckets into the basin. The fountains were built and maintained with great pride by each city and were often elaborately carved and decorated with symbols of the city and its leading families. Families had to walk to the fountain to fill pitchers and casks, but businesses were supposed to find another water source. In the 14th century, Perugia enacted statutes to make sure water would remain clean in the public fountain. Jugs dipped into the fountain's pools had to be washed first, and small bronze jugs were chained to the fountain so that they never touched the ground. Some towns appointed a warden to watch over the fountains to keep people from dumping trash or dirt into them or from taking too much water. Washing clothes and personal bathing were strictly forbidden and carried heavy fines. The fountains had to be scrubbed out periodically, even so.

Water for industrial and large-scale use had to be obtained somewhere else. Siena had industrial fountains throughout the town that were assigned to certain trades. The guilds maintained them, and they had to be cleaned much more often than the public drinking fountains. Some had pools where businesses were permitted to wash wool, meat, **fish,** or **cloth.**

Some Italian cities, such as Bologna, used a system of small canals that flowed through city neighborhoods and could be controlled by gates. Neighborhoods knew which days they would have water for washing and also were expected to keep their streets clean. In Italian communal towns, neighborhood wells were regulated and cleaned frequently; they had to be walled and provide a windlass and a clean bucket.

London's Chepe market had a public water system called the Great Conduit, built in the 13th century. It was a large system of pipes that brought water chiefly to the main fountain in Chepe but also to the side markets of East and West Chepe. It also provided water to households and neighborhoods in other parts of London. The water came from springs in Tyburn and other streams as far as three miles away. In a city system like this, the main pipes were five or six inches wide, but pipes bringing water into a house or business were supposed to be only a finger's width, and sometimes no thicker than a goose quill. This limited a house from using more than its share of water. Most houses did not receive water privately, but instead contributed to maintaining the neighborhood fountain. Some public water supplies were placed inside a building that could be locked up for the night.

The Conduit required a fair amount of upkeep and policing. Brewers, who used water in very large quantities, were not supposed to use the Conduit water freely. Other business uses that would use up or foul the water had to be watched. Some butchers and fishmongers washed their meat in the fountains, leaving blood and pollution behind. The pipes and tanks

needed constant maintenance, with dues paid by residents and businesses. By the 14th century, the aging water mains burst at times and flooded Fleet Street.

Other medieval cities had similar systems, but water supply remained a constant problem. Springs ran dry, and cities had to find new sources. People dirtied or damaged the fountains, and everyone accused others of taking more water than their share. Paris forbade professional water carriers from filling their casks at public fountains during the night; they had to fill their buckets as quickly as possible, and only if the reservoir was full. Some people stood in line many times a day to get public water, and as the population rose, the lines got longer.

See also: Beverages, Cities, Hygiene, Latrines and Garbage.

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Weapons

Personal weapons were very important during the Middle Ages, since during most of the period, there were not only invasions and foreign wars, but also civil wars, uprisings, and robbers. Everyone carried at least a knife, and many men tried to have better arms. The trend during the 1,000 years of the Middle Ages was toward more steel and more machinery. Weapons achieved a certain amount of art and beauty during the golden age of the **knight,** but as **gunpowder** was introduced, the Middle Ages closed with the new use of primitive handguns.

Weapons varied not only by time but by region. Some regions were conservative and relatively primitive, such as Scandinavia's tendency to continue using Viking-style weapons to a late date. Some regions were more in contact with foreign cultures and were influenced by them to use different weapons and tactics. Spain's **iron** deposits put their smiths at the forefront

of developing swords and steel. Italy was ahead in war machinery, such as crossbows and guns.

At any given time, the greatest difference in weapon use was by social class. The arms that an aristocrat could carry were very different from the arms of a peasant. Only nobility could use swords; at the height of the Middle Ages, most people lived their lives without ever touching a sword. Peasants used spears and bows. Mercenaries used machinery that required technical ability.

Spears

The spear was the primary weapon in early medieval Europe. Every Anglo-Saxon and Frankish warrior had at least two spears, a throwing spear and a longer lance. The right to carry a spear went with freedom; a **slave** caught with a spear was severely punished under Charlemagne's laws. Anglo-Saxon and Frankish lances had broad, flat, very sharp heads and were attached to strong ash poles about eight feet long. Throwing spears, called darts, often had barbed heads. The barbs were not small, as on a fishing hook; they were large and long. The spearheads, however, were not large, and they could be mass-produced inexpensively on early forges. Darts were mounted on lighter, shorter shafts. Warriors probably considered them throwaway weapons, while their lances were expected to survive the battle or be reparable.

Hunting spears continued to be used all through the Middle Ages, especially for fighting **animals** that were too dangerous to encounter at close range. Wild boars rushed at their attackers, and boar spears had to be about nine feet long to spear the boar when he was not yet close enough to bite.

Spears were always primary weapons in war. The Bayeux Tapestry shows them used on both sides, Norman and Anglo-Saxon. Lances on the Bayeux Tapestry are about nine feet long and seem to be used for thrusting and stabbing, not for throwing. Lances often had a relatively long spearhead, similar to a bayonet.

The lance also developed as the mounted knight's spear, held in front during a charge. These lances were up to 14 or 15 feet long, since they had to reach in front of the **horse.** In war, they had real spear points and were used by a line of knights charging at a gallop. For **tournaments,** the lance lost its point and became blunt. It underwent more changes as tournament jousting became a sport. The jousting lance was thicker at the handle, in order to move the center of gravity toward the knight's hand. Its purpose in a tournament was to knock the other knight off his horse, not to pierce his armor.

The lance of the foot soldier developed into a variety of forms of special spears with ax heads. These are generally called polearms; they were developed to allow foot soldiers to fight against mounted knights. Polearms were

A cavalry charge with lances was an unstoppable war machine until the development of polearms. Knights practiced constantly to maintain their skill in unhorsing opposing riders while ducking oncoming lances. Once a line of knights had unhorsed their opponents, smaller weapons were used to fight on foot. (James Robinson Planche, *An Illustrated Dictionary of Historic Costume*, 2003)

all basically a long pole with a complex blade mounted on the end, a blade that was designed to do several different tasks. A good polearm could cut, stab, bludgeon, and hook. It is likely that they began as peasant or townsman innovations for making weapons using farm or craft **tools**. Laborers in an orchard had to use a blade mounted on a pole to cut tall tree branches, and the blade could be like a saw, a knife, an ax, or a hook. All these blades were useful against mounted knights.

Names for these weapons varied, since they were developed and used by untrained local fighters. They did not develop international terminology the way knights' weapons did. This makes it difficult to know exactly what the kinds of poleaxes were. In 14th-century England, poleax weapons could be called godenac, croc, faussa, pikte, guisarme, or vouge. The different names could have signified technical differences among these weapons, or they could have been just different slang words for essentially the same poleax.

The 12th-century gisarme (or giserne) usually had a hook on the end of the pole. It may often have used a broad, curved ax blade, as well. It was similar to the earlier medieval bill and the later pike and halberd.

The pike was a very long, two-handed weapon used after the 12th century. The shaft of a pike could be as long as 18 feet, while the spearhead was short and sharply pointed. Pikes were used in a block, with the pikemen

Polearms combined spear and ax, then added hooks that could pull a man from the saddle. There were many variations and names; pike and halberd are among the best known. Halberds like these pictured were used in decisive battles around 1300, when private citizens defended themselves against attack by knights. (Dreamstime.com)

standing behind each other in rows in the formation of a square. When a pike's end was jammed into the ground, it was strong enough to impale a charging horse.

In the 14th century, the halberd was developed in Switzerland as a spear with a unique defense against knights on horseback. In addition to a long spearhead, the halberd had an ax blade and a hook for pulling men off their horses. In two key battles, the halberd was able to defeat knights in chainmail. In Flanders (1302) and in Switzerland (1315), peasants and town citizens with halberds used terrain conditions to defeat larger forces of knights. The development of the halberd was one reason plate **armor** began to replace mail.

Swords

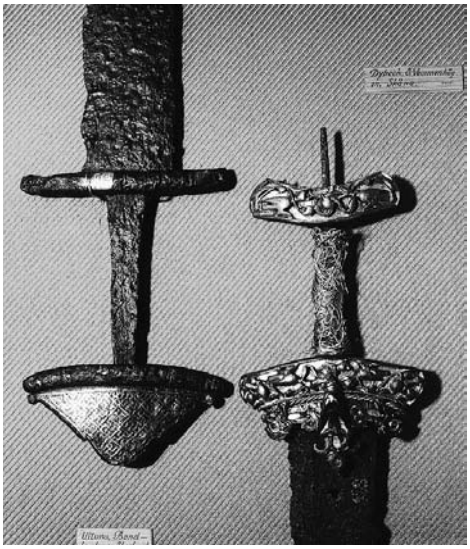
The sword was always the weapon of the aristocracy. Commoners were allowed to have long knives, but the true sword was forbidden, as well as too expensive. European swords were sharpened on both edges, whereas the swords used by Arab and Turkish armies were curved and only sharp

on the outer edge. Sword design evolved during the Middle Ages as metalworking improved and fighting conditions changed.

Early medieval swords were very flat and had elaborate pommels and guards to block the user's hands from blows. We have many swords from pagan graves, in Sweden, Denmark, and England, from early Anglo-Saxons and from later Vikings. The wood and leather handgrips on these swords have rotted away, so the remaining grip is just the tang, the iron bar between the blade and the hammered-on pommel. The guard is a short bar at the end of the sword's blade, but the pommel is often enameled, jeweled, or **gold.** Naturally, common warriors had less interesting swords, but the sword was always viewed as the king of weapons, and craftsmanship was lavished on it. Only aristocratic Frankish, Anglo-Saxon, and Swedish warriors carried swords, so swords tended to be expensive and elaborate.

During the 11th, 12th, and 13th centuries, swords came in many sizes but were basically grouped into war swords, used with one hand, and very long swords called two-handed swords. War swords were not small; they averaged about 36 inches long and weighed about three pounds. The grip added another 7 or 8 inches. A war sword like this was used most often when fighting on horseback, since it was long enough to reach away from the horse but light enough to use in one hand.

Two-handed swords had blades averaging 50 inches, and the grips were 12 inches, allowing room for two large hands in armored gloves. The two-handed sword could be used to cut and stab, but also to block an opponent's blows. Its pommel could be used as a small club. Although the sword was so heavy, it was carefully balanced to make it easy to wield. The



Swords were the highest-class weapon in early medieval Scandinavia. The pommel and hand guard were usually decorated. The pommel's elaborate designs could include enamel, engraving, and inlaid precious metals or stones. The end of the tang that formed the hand grip was encased in wood and leather handles that have broken and decayed over the centuries. (Statens Historiska Museum, Stockholm/Werner Forman Archive/ StockphotoPro)

heavy pommel acted as a counterweight to the blade. Knights had trained with these weapons since they were young and could handle them with dexterity.

In the late Middle Ages, swords to fight against plate armor had to be shorter, thicker, and reinforced. They were used more for thrusting than for slicing. Slicing swords tended to be long and heavy. The 14th and 15th centuries saw a trend toward smaller, lighter swords in many parts of Europe.

Sword construction was basically the same for all types. A sword's blade was made with a long tang—that is, the end of the blade sticking down to where it will become part of the grip. A guard for the hand was slipped over the tang, and then a wooden grip, and then the end pommel was hammered into place, holding it together. The wooden grip was often wrapped with **cloth** or leather, sometimes decorated in ornate ways.

The steel used for swords was very hard and not easily scratched. The sword's blade was kept razor sharp. Although steel making had not yet been fully developed, blacksmiths had learned how to use charcoal and a second firing to add carbon to the iron as an outer coating. This case-hardened steel was stronger than wrought iron, and it could be polished to mirror smoothness.

Swords were hung from a girdle, a belt around the waist, or a baldric, a strap over one shoulder. In battle, swords may have been hung with bare blades, ready to pull, but in training and for travel, scabbards protected the blade from rust or from hurting anyone. Scabbards were sometimes attached to the leather belt directly but also could be clipped to it with rings and hooks. The sword was not carried high on the waist or strapped tightly. Sword belts hung lower so that the sword's handle hung at the upper thigh, not the hip. The sword's pommel could also have a chain or leather strap that wrapped around the knight's wrist.

The early medieval Saxons had been named for the characteristic long knife they carried, which they called a seax or sax. From this long knife, a humbler sword developed, called the falchion. It was only sharp on one edge of the blade, which was curved. The other side was straight and dull. It was more like a kitchen knife.

Daggers were long knives that were more like small swords. The Latin word for a dagger was *cultellus,* from which the word *cutlass* developed. Some daggers had both edges of the blade sharp, like a sword, and others had only one edge sharp, like a falchion or saber. While daggers were widely used, knights did not carry them until the 14th century. Until then, they were the weapons of peasants. Daggers were also easier to hide and were more often used for assassinations than the great long swords.

In the **Muslim** regions, swords had always been curved; they are known to us as scimitars or sabers. They were sharp only along the outer curve of

the blade and were used for slashing. They were used somewhat in European areas that had greater contact with Muslims, such as in the Byzantine regions, and among the Huns who had migrated from Central Asia with sabers. The Huns became westernized and stopped using sabers during most of the Middle Ages.

Axes and Clubs

The Franks were named for the throwing ax they used when they first invaded the Roman Empire. The Romans called the throwing ax a *francisca*. The Franks also carried larger axes for fighting at close range. These axes must have been similar to what they used to cut wood and were about the same size and shape as a full-sized modern ax.

Battle-axes were a main weapon for the Vikings who invaded England, France, and Russia in the ninth century. The ax heads were not broad, and they were forged to have a hole through the back so that a wooden handle could be attached. By the 11th century, their axes blades were broader and were known in Anglo-Saxon records as "Danish axes"—the largest kind.

During the Middle Ages, some knights used axes while on horseback. The axes were not large and could be carried easily as an adjunct to other weapons. By the close of the Middle Ages, these horsemen's axes often had a sharp pick on the other side.

Axes developed into longer and shorter variants. The long ones, poleaxes, merged with spears. Another ax development was the war hammer, which had a short shaft closer to the size of a modern hatchet. The war hammer had a point on the end, a pick at the back, and a two-pronged hammerhead.

The mace was a club, sometimes with a rounded end and sometimes with short blades or prongs. A mace with sharp spikes could put a hole in a knight's armor, but it could also get stuck. However, there were maces with sharp spikes all around an iron ball, and some maces had the ball attached to a chain for greater force. Maces were knights' weapons, although they were less elegant and chivalrous than the sword.

Bows

The longbow was originally from Wales but was adopted as the national weapon by the English during the Hundred Years' War with France. Longbows had been the chief hunting weapon of early medieval Europe. They became weapons of war during the 10th century. Hunters did not use barbed arrowheads, but otherwise their bows were the same as those used for war.

Longbows were sized to each individual archer and were around six feet long. They were either straight or somewhat curved forward. They

were most often made of yew wood, and the strings were hemp or flax, rubbed with beeswax. Arrows for a longbow were about three feet long. The wooden shafts were made of aspen, ash, and other woods and were carefully cured so that wetness in the wood would not cause warping. They had forged-iron arrowheads, and different types were used for different military purposes. Many arrowheads for war were barbed. Goose feathers were glued and sewn onto the notched ends by professional arrow makers, called fletchers. Three rows of feathering, each six to eight inches long, constituted typical fletching.

The secret of the longbow lay in the bowmen's lifelong training to use the weight of their bodies, not the strength of their arms, and to shoot quickly and accurately without needing to take visual aim. Boys were trained with small bows from the age of seven. A good archer could shoot a dozen arrows in a minute, and all would hit their target, at 400 yards. Bowmen went into battle with only helmets and swords, sometimes shields, and sometimes with less. Some bowmen fought in bare feet so that they could better grip the ground. Because bowmen shot so fast, they needed to carry many arrows into battle. At a rate of 12 arrows per minute, 60 arrows would only provide five minutes of shooting.

In the Mediterranean and Byzantine regions, bows could have been shorter and more like Roman bows. They were composite bows made of several materials laminated together, perhaps wood strengthened with bone. They were probably recurve bows, in which the wood curves away from the archer and stores more tension than a single piece of wood that has been bent into a longbow. Short bows were more useful for fighting on horseback, so they were also used by invading Mongols, Huns, and Turks.

The crossbow, also called the arbalest, had been used in Roman times, and it continued to be used as a hunting weapon in some places. During the 11th century, it appeared again as a weapon of war. The Bayeux Tapestry records crossbow use at the Battle of Hastings in 1066. Although the Normans used it in their conquest of the English, the crossbow was never as popular in England as the native Welsh and English longbow. The crossbow was most popular in Germany and Italy, where it was used for hunting as well as for military purposes. In some German and Italian cities, crossbowmen formed shooting **guilds.** After the 13th century, its use spread north again; the crossbow began to be used by even the primitive warriors of Scandinavia.

Crossbows were powerful, but slow, compared with the longbow. The crossbow was often used by the defenders in a **siege,** since they could slowly pick off attackers at a distance while staying out of sight behind a parapet. Crossbows were made larger, and sometimes stationary, for siege defenses. Personal, portable crossbows continued to be very numerous and were always being improved.

The crossbow was a short, powerful bow mounted on straight wooden stock with a tough bowstring pulled back and locked with a latch that had a lever trigger under the stock. The bowman did not have to pull the string and aim at the same time; he could span (load) the crossbow, take aim, and fire a trigger when ready. The arrows were short and were called bolts. They fit into a groove on the wooden stock in front of the bowstring. Early crossbows required the user to put his feet on the bow and pull hard on the string to put it into firing position, and later crossbows added a stirrup to the end to make this easier.

During the 12th century, crossbows were made with composite materials such as horn, sinew, and wood. As crossbows became more powerful, they required a mechanism to pull the bowstring back. At first, this was a hook that required powerful body strength to use, but in the 14th century, crossbows used a windlass and ratchet to crank the bowstring into place.

See also: Armor, Gunpowder, Hunting, Knights, Sieges.

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Weddings

European marriage customs differed less by region than by social class. All across the continent, the aristocracy who owned land followed customs of inheritance and family composition that were dramatically different from the peasants and artisans of country and town. Aristocratic families needed

public, legally defensible weddings because large amounts of land and authority were at stake. Peasants and townspeople could form private marriages since their property was sometimes not more than a few **kitchen utensils.**

Marriage and Divorce

The heartland of Europe—France and Germany—was settled by the Franks during the early Middle Ages. After the Franks converted to Christianity, there was a long period when their marriage customs did not change and were in conflict with Christian teaching in Rome. Frankish kings had always been focused on producing an heir, whatever it took. They could be polygamous, or they could have a legal wife and concubines. Frankish kings could marry a pair of sisters, and some could have been in sexual relationships with their own sisters. Divorce was easy; a Frankish noble just had to repudiate a wife and send her home, and any reason would do: lack of children, illness, misconduct, or just changing his mind.

The traditional Frankish wedding ceremony began with betrothal and a formal agreement on terms of property transfers. The man gave the girl a ring when this was concluded, and he gave the bride's family a sum of money—a token brideprice. The wedding consisted of giving the bride to him with a public ceremony and feast, but we know little about the ceremony. The morning after the wedding, the man gave his bride an additional sum, the "morning gift." These gifts could be money or land. The custom of the morning gift persisted until the 12th century, when new inheritance laws made it impractical.

In Charlemagne's time, both boys and girls married in their early teens. However, even during that period, the normal age of marriage began to shift later for men. The marriage age for girls went up from 12 to 15, and some men were not married until their late 20s. This remained the average in Europe through the Middle Ages.

The **church** in the early Middle Ages viewed divorce as a real fall from the ideal of lifetime monogamy but did not forbid it. There were valid reasons to divorce, and, in some cases, remarriage was permitted. Those who divorced were given penances. Increasingly, as the church's power grew, not the secular nobles but the bishops ruled on contested divorce cases, and they were less and less likely to uphold the divorce. Since wives were often repudiated in an abuse of power by the husband, this protected the rights of **women** to some extent.

When Charlemagne became the Pope's military defender and was crowned Holy Roman Emperor, it became important to force the Franks to follow traditional Roman Catholic marriage customs. The church proclaimed stricter rules about marriage and divorce than they had previously

enforced. No man could have more than one wife. That wife could not be a relative closer than a cousin in the seventh degree. No divorce was permitted, unless the wife had been grossly at fault, and that divorce must be approved by the church. Charlemagne himself set an example of following these rules. In his quest for heirs, he married five times, but never more than one woman at once. He repudiated one wife before he was crowned emperor, but he persevered as an example of fidelity after that.

When the church made these rulings, there was a cultural mistake that had grave results for centuries. Romans had counted degrees of relationship differently from the Franks and other Germanic nations. In the Roman system, a fourth-degree relative was a simple cousin; a seventh-degree relative would be a somewhat more distant cousin. But the Germanic method of calculating relationship was different: a cousin was only a third-degree relative, and a seventh-degree relative was anyone descended from the person's great-great-great-great-great grandfather. This degree of relationship often included everyone in a village, as well as most of the aristocracy. The church also barred people from marrying the widow of a blood relative or someone related to a godparent.

These consanguinity rules were so restrictive that most people had to ignore them, or else they would never marry. They provided a loophole for marriages to be annulled when divorce was not permitted. King Louis VII and Eleanor of Aquitaine had their marriage annulled after 15 years and two daughters because they were related to the fourth degree. The truth was that they had come to dislike and distrust each other, and Louis needed a son. Once their marriage was annulled, Eleanor married Henry of Anjou, who was related to her in the same degree as King Louis VII.

The Fourth Lateran Council of 1215 rolled back the consanguinity laws to forbid relatives of the fourth degree but permitted the fifth, sixth, and seventh degrees to marry. It maintained other aspects of these laws, and degrees of relationship continued to provide a means of annulment for the rich and powerful. Medieval Popes usually granted these annulments.

Before the Second Lateran Council of 1139, many priests were married. If a priest was elevated to a bishop, he was expected to set an example of celibacy, like a monk. Bishops had to place their wives in convents. It was not a period of strict enforcement, though. Some nobles and kings still had concubines, and unmarried men often kept a concubine they did not plan to marry. Since commoners could live together without any real ceremony and be considered man and wife, it was unclear what it meant to have a concubine. What rights did she have, when many legitimate wives did not have wedding ceremonies?

Church law, trying to grapple with what legal status to give a man's concubine, finally came to rest with the Fourth Lateran Council in 1215. Private weddings were no longer to be legally upheld. Weddings must be

public, and they must be preceded by a priest's reading of the banns, the statement on intention to wed. The banns must be read on two successive Sundays, so anyone had time to object if the person was already married or if they were too closely related. From this time on, medieval weddings began to develop into a standard form all across Europe.

Difficulties of Consent

The primary concerns in weddings were personal consent, proper witnesses, and a proper distance of family relationship between the bride and groom. The community could ensure witnesses to the degree of relationship and to the ceremony itself. Ascertaining consent was more difficult. In a proper ceremony, both individuals had to say, clearly, that they consented to take the other person as a spouse. The two chief problems were child marriages and family coercion, when one party was forced to give consent that was not real.

Children of the aristocracy married much younger than commoners' children. Parents were concerned about establishing the correct family alliance in case they suddenly died and left the task to a guardian. Betrothals between small children took place, as did actual weddings; royal marriages could involve infants. Even when the marriages were arranged as though the individuals were adults, the girls were often no older than 13. It was not possible for such young children to give real consent. When small children were married, adults had to say the vows for them.

The church disapproved of child weddings, since the children could not consent. There were cases of young people who had been betrothed or married as small children but who refused to fulfill their obligation when they were old enough. The church upheld their right to refuse consent when they were of age. A general consensus developed in England, though it was not applied to royalty, that there should be no betrothals of **babies** under the age of seven. After the age of seven, betrothals could be contracted by the families, but the wedding itself must wait until the young people were fully of age to consent.

Commoners' children were traditionally well into their teens and 20s before they married. By the late Middle Ages, most marriages took place between young adults in their 20s. However, coercion could be just as much of a problem even when the property was relatively small. Many marriages were still more about money than about love. Love came after, if the couple treated each other well. Before the wedding, it was all about getting the best deal.

At the lowest level, even in the 13th century, English serfs who were considered unfree had to pay a fee, called the merchet, when a daughter married. The merchet was probably higher if the girl married a man outside the lord's manor, since he was losing a worker, so there was an incentive

for the girl's family to persuade her to choose someone else. The fee was paid with goods such as chickens or bags of oats. A peasant girl's dowry at this time was her share of the inheritance and was usually household goods, **animals, clothing,** and, less commonly, money.

Middle-class marriages involved complicated negotiations over property, even if the property was not very valuable. Personal liking was a factor, but it was not the biggest one. The man's family was shopping for the best dowry they could find; they might have low-level negotiations with more than one girl's family. A girl with few siblings could receive a larger share of property and could make a better match. The families negotiated openly and bluntly, raising their requests on each side as they bargained for the present and future finances of the couple.

Because social hierarchy was such a very important part of the medieval world, young people often agreed with their parents' interest in the financial standing of the other families. If the young man or young woman did not know any of the individuals under discussion, or had only met them once, then the most exciting prospect of the match might be to live in a **stone house** or to have five cows. These advantages promised solid benefits of health and friendship in the future; girls married into a station in life, and this was the only moment of choice.

There were two halves to the negotiation, since both families were expected to contribute. The dower was the contribution of the man's family,

Until well after the close of the Middle Ages, a couple did not wear special clothes to their wedding. They wore the finest clothes they had, but expected the garments to be worn on many later occasions. This folk painting commemorates a medieval wedding in Sweden. (Uppsala University Collection, Sweden/Giraudon/The Bridgeman Art Library)

and the dowry was from the woman's family. The dower was a contractual amount of money or land that stayed with the woman if she became a widow and would then go to her children. In a simple family with a single husband and wife and children, this would not be a complicated business. But in some cases, a husband or wife married more than once, and there were stepchildren. The marriage contract specified what family property could go with her if she remarried as a widow and what property would stay in the man's family, perhaps reverting to his brother in the absence of sons. The dower was security for her future.

The importance of the dowry increased over the medieval period and became especially important in cities. In Italian **cities** like Florence, relatives left money to nieces, cousins, and granddaughters for their dowries, aware that even a small increase could make a big difference in a girl's future life. A dowry was one of the biggest investments a family could make in its posterity. By the 15th century in the cities, dowry amounts were highly competitive and took up much of a family's wealth. In rural places and in Northern Europe, dowries could be a mix of money, land, and possessions such as animals or **furniture.** It was also common to promise a girl a certain amount immediately and another portion on the death of her parents. Some women passed to their daughter items they had received in their dowries, like bronze pots or **silver** spoons.

Although families arranged marriages, the theory was that marriages were not to be forced, and both individuals were to be freely consenting. There was no way to inquire closely as to how free consent had been obtained, and in some cases, it was not completely free consent. Families often put heavy pressure on a girl to marry a man they preferred, even if he was much older than her. Some girls were pressured to marry a man as part of a deal to cancel a debt the family could not pay. Employers could put pressure on a man to marry a girl he had corrupted. Sometimes, even after a marriage contract was notarized, a relative or other party came forward to say that a prior marriage offer should prevent the wedding. Since verbal agreements were legally enforced, it could be difficult to disprove the truth of such a prior agreement.

Orphans posed a particularly difficult problem concerning consent, and it demonstrates why wealthy parents were so anxious not to leave unbetrothed orphans. Children of any social class who were wards of an individual, or of the town, could have their wardships bought and sold, even to strangers. Sometimes, a widowed mother had to buy the wardship of her own children to keep them with her. Sometimes a wardship was bought and sold several times, and the last one holding it when the child came of marrying age could determine the match. Men occasionally bought a wardship in order to marry the child to one of their own children. Sometimes the wardships were obtained solely for the fees associated with marrying the

child off, if the child had no property. The wards themselves had no legal rights until they were of age.

In theory, an orphan had to consent to a match, but, in fact, orphans had no voice in the matter. Even aristocratic orphans, wards of a king or a bishop, were married off in a way that best profited the guardian. Poor orphans in a city, wards of the mayor, were married off for the sake of the fees paid for the wedding. Orphans with a small amount of property were desirable because the city released the property immediately, whereas living families might delay on the donation or change their minds.

Courtship was supposed to be the solution to these dilemmas. When a young woman, either a girl or a widow, was a desirable match, the man courted her to gain her consent. He met with her to talk and gave her gifts. Consent was the key point that made a marriage legal. In late medieval England, although marriages were supposed to be proclaimed in public, private marriages were still legally binding. The couple only had to say the words "I take you as my husband" or "I take you as my wife" before witnesses for the contract to be legally enforced. If either one could be temporarily swayed into speaking these words in a **tavern,** before witnesses, he or she would be in a legal, permanent union. Family consent was recommended as a protection; while families could be swayed by financial concerns, they often had good notions of how to protect a young person from a swindler. Girls were not supposed to allow a man's attentions until the family had screened him.

Wedding Ceremonies

Medieval weddings rarely took place inside churches. The banns had to be proclaimed in church, since it was a weekly public meeting. The ceremony, however, took place on a weekday, in the marketplace or on the church steps. It had to be in a visible place with witnesses and provide an opportunity for the general public to see.

Weddings could not take place during a major **fast** season. This ruled out the month of December, the season of Advent before Christmas. Lent, the 40 days before Easter, was ruled out, as was the period between Ascension Sunday and Pentecost, after Easter. Christmas and Easter were popular times for weddings, since they were **feast** seasons anyway.

The wedding ceremony in 14th-century England was typical of Northern Europe and only somewhat different from the Mediterranean region. The families and friends of the couple came to the church square; the couple wore their best clothes, but only royal weddings featured specially made garments. A priest usually officiated, although there was no church service unless the couple attended Mass afterward. (In upscale weddings, the family often paid for a celebratory Mass.)

Standing on the steps outside the church, the priest asked them both if they were legally free to marry. Were they both of age? Were they not within the forbidden degree of relationship? Were they both freely consenting to this union? Either before or after their vows, the priest joined the couple's hands.

A typical late medieval wedding vow said, "I take thee, Joan, to my wedded wife, to have and to hold, from this day forward, for better, for worse, for richer, for poorer, in sickness and in health, till death us depart, if holy church will ordain, and thereto I plight thee my troth." When both parties had spoken their vows, the priest blessed the wedding ring. Only the bride received a ring. The groom slipped it onto the bride's thumb, and then the first, second, and third fingers, saying, "In the name of the Father, the Son, and the Holy Ghost, with this ring I thee wed." The ring came to rest on the finger still known as the ring finger.

After their vows, the couple gave alms to the poor. Sometimes the priest delivered a homily on the meaning of marriage, and sometimes they went into the church for a celebratory Mass. Most weddings were followed by a feast as splendid as the family could afford. In the cases of **castle** families, the feast may have lasted more than one day. Entertainment by **minstrels** was customary. The guests also sang and danced to folk tunes.

The charivari was a folk custom that began in rural France but spread to other countries. Revelers wore masks and made loud noisy music to annoy a newly married couple. The revelers often ended up brawling, and they broke local noise ordinances. In some regions and social classes, the feasting guests also accompanied the bride and groom to their new bed.

In medieval Italy, dowries grew to be huge, and both betrothal parties and wedding feasts were expensive and showy. After the marriage contract had been notarized, the groom and his family made a procession through town to the bride's house. They made as much of a parade as possible, since it was a public announcement. There, they had a feast with entertainment, and it may have been the groom's first chance to meet the bride, who was often sheltered from public view.

As much as a year could pass between the betrothal ceremony and the wedding, also called the "ring day." On that day, the groom and his family came to the bride's house with a wedding ring. The wedding guests also attended, and the couple made public vows of consent to the marriage; they may have been in the public square, outside the bride's house, or on the church steps. The notary posed questions to ascertain consent, and then put the bride's hand toward the groom to receive a ring. If a priest were involved, he blessed the ring. The groom's party presented gifts to the bride, and the bride's family gave a feast. The bride's trousseau was delivered to the groom's home, but the bride did not go to his house yet. Gifts continued to go back and forth. Finally, the bride was transported to the husband's

house, at night, with torches, on a white horse. In Rome, they stopped along the way at a church for Mass. With the bride at the groom's house, the marriage was finalized, but there could be feasts for several days.

Italian weddings were such displays of wealth that by the late Middle Ages, towns were passing sumptuary laws against the most conspicuous elements of the display. The wedding was an event for the community, and the family put on its best show. Even wealthy families borrowed or rented such luxuries as **tapestries,** a "cloth of gold" dress for the bride, drapery, vases, statues, and **paintings.** The bride's family courtyard was turned into a palace for a day.

Poorer families borrowed, rented, and displayed what they could; relatives contributed their finest things for the day. In a city neighborhood with cramped housing, the alley or street could be turned into the venue for the party. A 16th-century illustration of a poor man's wedding shows the neighborhood courtyard readied for the party. A sheet is suspended over a table that has napkins and pitchers of drink, and musicians play nearby for the dancing couple. Neighbors look out the window or stroll in. The **music** and dancing at an Italian wedding went late into the night.

In Christian Spain, during the era of Reconquest, girls had equal inheritance power and brought into the marriage a significant trousseau of household furnishings. The bride rode a horse in a public procession to the church, usually on Sunday, where the wedding was blessed by a priest. The groom's family paid for a feast.

See also: Feasts, Jews, Minstrels and Troubadours, Women.

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Weights and Measures

Measurement standards varied regionally but were extremely important within each region and time. Merchants measured as accurately as possible, and cheating on a measurement was a crime. Prices were usually regulated by **guilds,** and this required them to have standard measurements. Although measures were determined locally, when international traders got involved, they developed tables of conversion. Weights and measures even differed depending on what goods were being measured. The Roman Empire introduced a standard weight, the libra, but in medieval Europe, standards varied across professions. Only in later times was there any attempt to unify these traditional measures.

Goods sold by weight came to be called avoirdupois, which means "having pounds" in French. Many common foodstuffs were avoirdupois goods. **Cloth** was sold by length and wine and wheat by volume. Officials at **fairs** and ports had to know how every trade measured its goods. They had to keep on hand the local, regional, or national standards of measurement and enforce their use. Weighing, taxing, and certifying were big business in the Middle Ages.

Weights

No situation could be as thoroughly confusing as standards of weight in medieval Europe. They varied both regionally and by trade. One medieval European weight was the centner, which was approximately 100 pounds. The centner's weight varied, though; some of these weights have survived into modern times and can be compared. A centner of **iron** or lard was heavier than a centner used in the **food** marketplace. A centner of yarn was different from a centner of silk. In medieval Paris, in the 12th century, there were two royal scales. One weighed only wax (in *poids de la cire*), and the other weighed everything else (in *poids-le-roy*). In England, weights were taken in stones, pounds, and ounces, but when weighing **silver** as **coins,** they were pounds, shillings, and pence. A stone of **glass** was much smaller and lighter than a stone of **lead.**

As Europe became more industrial and commercial, rulers stepped in to regulate the measurements in their territory. The English Magna Carta, in the 12th century, stated that the realm needed standard weights and measures, rather than local ones, but nothing was really enforced. At the close of the Middle Ages, many kings were still trying to outlaw local weights and impose their royal standards. In 1340, Edward III sent standard bushels, gallons, and pounds into each county so that they could regulate their weights.

When national weights were successfully imposed, their enforcement still depended on local officials. **Cities** had officially certified balances and

measures. The mayor leased them to citizens who made a living charging fees for on-site measurement at markets and ports. (In London, the smaller balance was traditionally leased to a **woman** as a way of helping a widow make a living.) Businesses then used the official balances to calibrate and certify their personal ones. The weights that businesses used had to be marked with an official mark by the blacksmith or balance maker who cast them. In some places, these personal weights were shaped into figures such as a lion or a rider on a horse. This tended to be an early, primitive practice, persisting in Scandinavia after Southern Europe had standardized to square, disc, or bell-shaped weights. Large weights always had a ring on top so that they could be lifted with a lever, if needed.

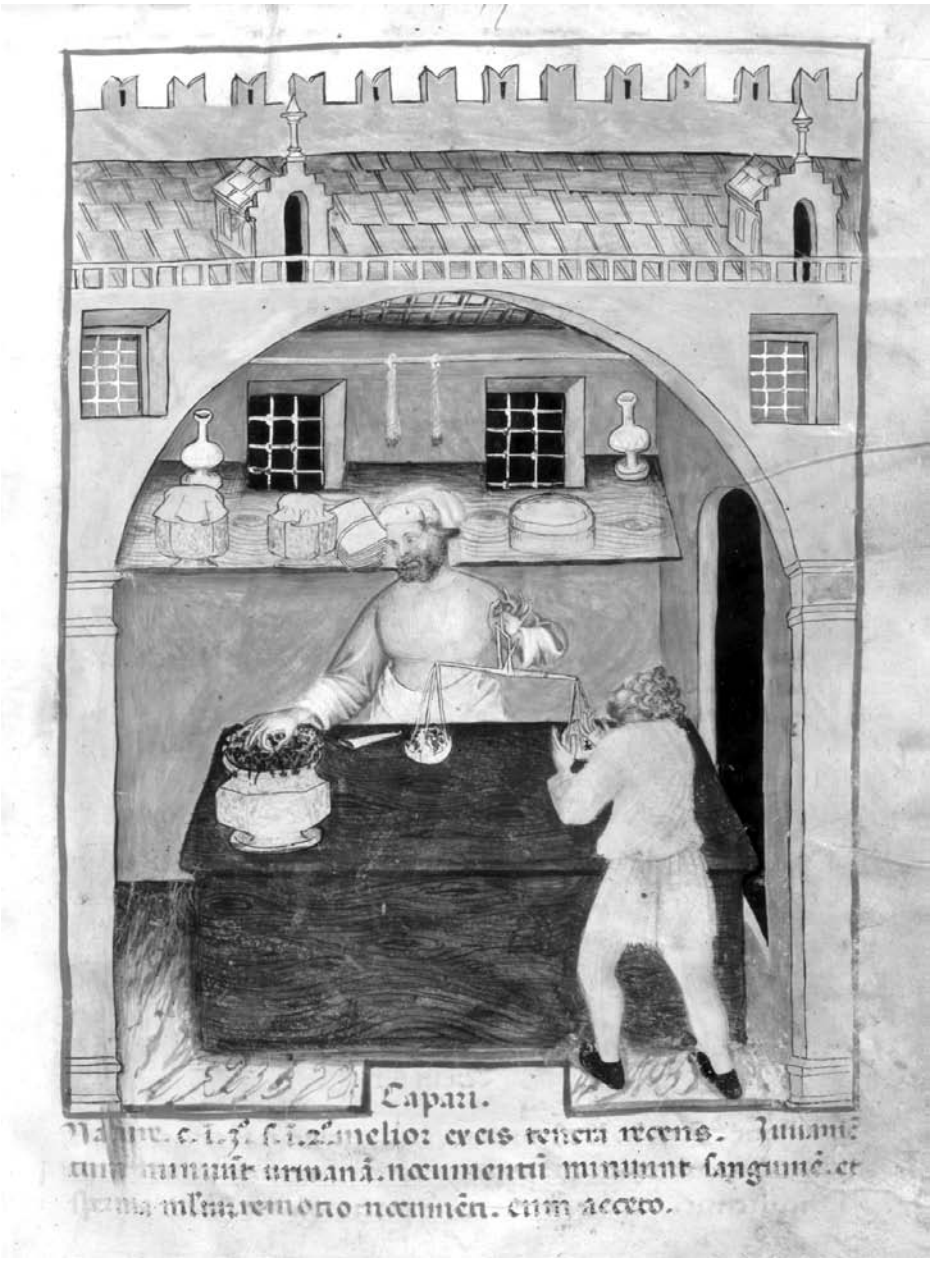
Weights were used with small and large balances, also called beams. Small balances measured in pounds, while the great beam measured by the hundredweight. Great beams were used in wholesale and importation businesses. The counterweights for both sizes were carefully regulated by each city. They were made of metal and carried an official stamp. In earliest use, they were iron, but the standard became brass. Cheaper, less official weights were made of lead.

Balances came in the form of pan balances and steelyard balances. Pan balances had two arms with pans, balanced on a fulcrum, with individual weights to balance the merchant's goods. Steelyard balances may have been promoted by Hanseatic League merchants, who dealt in very large quantities. On a steelyard balance, the horizontal beam hangs from a fulcrum, but this ring is not placed in the center. It is closer to one side, which has a pan or hook for the load to be measured. The longer arm has a weight that can be moved closer or farther from the fulcrum to balance the load. The weight does not change, but its position on the arm tells the measurement.

A city market had an official great beam balance with an arm made of iron or heavy timber. Small balances that weighed pounds and ounces were usually of brass, while tiny jewelers' balances could be made of silver or ivory. Fine balances used silk strings, usually green, to hang the balance pans. The great beam often had no pans, but rather used hooks and chains to hang the heavy goods. Merchants' balances often had wooden or iron pans. The finest scales for apothecaries and jewelers used ivory, glass, or some other easily cleaned substance.

Merchants who sold underweight goods found the goods confiscated, and they were also fined. Confiscated bread and wine were used to supply the prisons and some public employees. In some periods, public pillories were used to shame dishonest merchants. They were displayed with their dishonest wares hung around their necks, and citizens could mock or pelt them.

The Port of London became a highly organized weighing station by the 13th and 14th centuries. It was the first point of contact for all inspection



Most daily commerce depended on accurate weights and measures. Anything not sold by volume or length was probably sold by weight, so nearly every shop had a set of balance pans and weights. Here, cured meat such as sausage is being weighed for a customer. (Bibliotheque Nationale, Paris/Art Media/StockphotoPro)

and taxation, as well as for regulating foreigners entering the city. The port dealt only in wholesale goods. As these goods came into the port, the customs officials were ready with a team of men and horses to move them straight to the weighing area. Grain kept busy a team of eight Master Meters, each with assistants, horses, and sacks. The measuring teams had official bushels and strikes (rods for leveling bushels). Bakers and brewers came to buy their grain as it was measured out. **Salt,** too, was measured in bushels by its own team of officials and then loaded into sacks. Buyers and sellers paid the meters directly for their services.

Not all weighing was avoirdupois, of course. Some professions depended heavily on being able to weigh goods accurately. Apothecaries and medical doctors prescribed small amounts of **spices** and other substances using a system of ounces and drams. The "Troy weight" was another system of fine measurement from Troyes, in Champagne. It stipulated 20 pennyweight to the ounce and 12 (not 16) ounces in a pound. The Italian spice trade had a sophisticated system of measurements. More than 200 different spices could be sold in very large amounts or in very fine measures.

A goldsmith's set of weights and balances was specialized. The weighing of **gold** and silver coins was the measurement demanding the most accuracy. The production of accurate coin scales pushed royal governments increasingly into the regulation of weights. Coin scales could be either pan balances or steelyard balances. Some were made to measure one type of coin alone; the other pan was a set weight, and an indicator at the fulcrum showed whether the coin balanced it and by how many grains of gold it was off. The traditional measure of gold, the carat, was at first a carob seed.

Volume and Length

Dry volumes were somewhat less trade specific than other measures. In England, at least, the basic dry measure was the bushel, the standard basket for a packhorse**.** The peck was a quarter of a bushel, while eight bushels made a quarter. Charcoal was always sold in quarters. By the 14th century, bushels were carefully standardized in terms of the basic English liquid measure, the gallon. One bushel was equivalent to eight gallons. Most dry goods sold by volume worked well with bushels, but hay required larger measures. Hay came in wagon- and cartloads, but also in half loads and quarters and in smaller bundles called boteles and fesses.

Liquid measures were not simple, although in theory they became standardized to the gallon. Ale came in **barrels,** but beer and ale barrels were not the same size. Beer barrels were larger, perhaps because they hewed to German standards. English coopers made most barrels to a standard of 30 gallons, which were used as ale barrels. Barrels were also used for soap, oil, and eels. Smaller English liquid measures went from gallon to quart to

gill, which was about a modern cup. Large liquid measures included other kinds of containers, from tubs and **buckets** to various sizes of butts and casks. Ale in small quantities came in wooden quart containers made by turners, a special craft profession.

Wine was sold in special large barrels called tuns; tuns held 252 standard gallons of wine. At the Port of London, a team of 12 men had to be on hand to manage incoming tuns of wine. They had to be rolled into warehouses, sometimes near at hand and sometimes not so near.

The standard medieval lengths were the foot and the mile. A fathom was six feet, a mile was 5,000 feet, and a league was two miles. In England, land was measured chiefly with the furlong, the distance a peasant typically plowed in one direction. In modern times, the furlong is defined as 660 feet, one-eighth of a mile, but the medieval furlong was shorter. It was not related to the mile at all. The furlong was divided into 40 rods. When using a heavy moldboard plow, peasants always farmed in long strips, not square fields. For that reason, the acre was defined as one furlong (40 rods) by 4 rods. It was about how much land a yoke of oxen could plow in a day.

Cloth measurement was another regional jumble. Officially, all medieval cloth was measured in yards and ells, but the ell varied. Since the cloth industry was centered in Flanders, and its main selling took place at the Champagne **fairs,** these measures became the most international. In Troyes, a bolt of cloth was 28 ells, but in Ypres, it had to be 29. At the Provins fairs, cloth was measured by cords (12 ells) and lengths (12 cords). As if the bolts and lengths were not confusing enough, the ell varied. The Troyes ell was 3 feet, 8 inches, but the Provins ell was 2 feet, 6 inches. They used a system of feet and inches in which 12 inches made a foot, but the inches were also broken into 12 parts, called lines. Each fair had an official iron ruler, and merchants had wooden rulers that had to match it. The Champagne fairs came to an end before the industry could decide on a universal standard.

See also: Barrels and Buckets, Beverages, Cities, Coins, Fairs.

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Wheels. *See* Wagons and Carts

Windows. *See* Glass

Wine. *See* Beverages

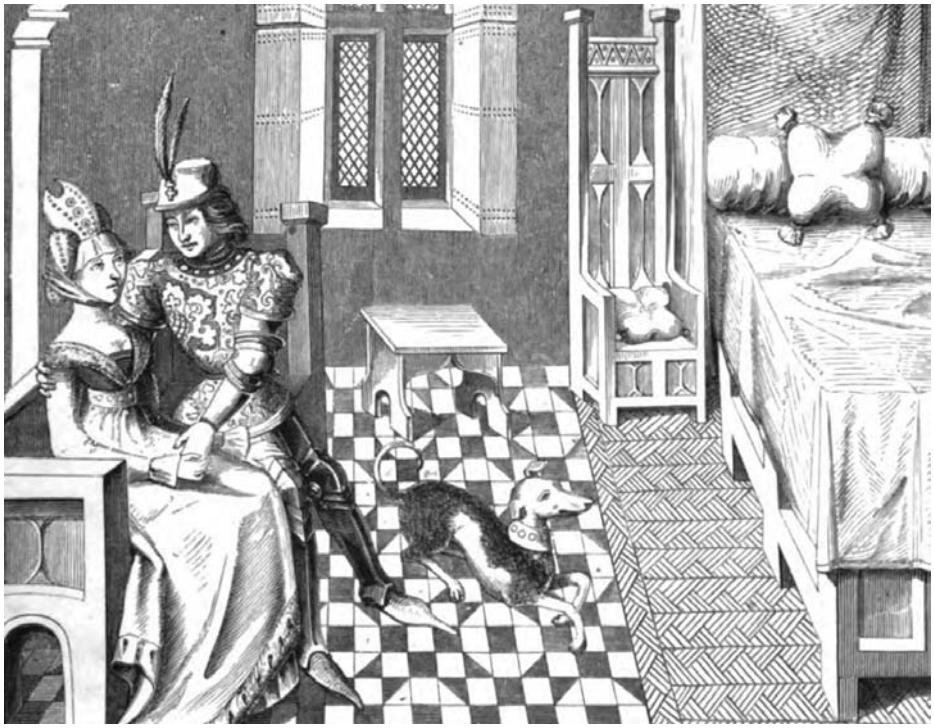
Women

The status of women in the Middle Ages varied with place, time, and social class. Of these three, social class was the most outstanding factor determining the role a woman could play in life. Changes in women's overall status came about partly because the middle class—merchants and craftsmen—grew during the later Middle Ages, and its treatment of women became more dominant. In each period, and in every place, we can distinguish three basic classes: the landowners, the townsmen who worked with their hands or as merchants, and the country folk who farmed. It was very difficult, if not impossible, to move up in class.

Land inheritance and dowries shaped the lives of girls in the upper class. They had no freedom to choose whom to marry and little freedom to decide even whether or not to marry. Parents or guardians chose husbands for girls, and if a girl married someone who was not approved, she could be (and often was) disinherited. In many parts of Europe, upper-class girls were married very young. Their parents could not be certain of living long enough to marry the girls at older ages and did not want the task to fall to a guardian, so they married off children as young as six. A child bride moved to her new husband's home and finished growing up there. Her husband was almost always a child, as well, and became a playmate.

In most parts of medieval Europe, the girl's dowry was a large determinant of whom she married. Girls from families that could not afford a large dowry could see their daughter slip into poverty by marrying badly or remaining single. In the later Middle Ages, as dowries skyrocketed, grandparents left money to girls in their wills, specifically giving to their dowries. Although the girls might never see a penny of this money themselves, it increased their chances of finding a respectable married home. Girls in the landowning class often had farms or manors as dowries, and in the highest-ranking families, they could bring small duchies or even kingdoms.

Married women of this class, the ladies of the **castles** and manors, had many responsibilities. They oversaw the household **servants,** and they



The castle lady lived a life of comfort and ease, but she also lived under very strict rules of conduct with little freedom of movement. The illustration is from a poem written by Christine de Pizan, one of the few successful women authors of the Middle Ages. A widow who had to support her children, she began writing poems, stories, and advice. The new availability of paper and secular copyists allowed her to sell enough books to become reasonably prosperous. (Paul Lacroix, *Moeurs, Usage et Costumes au Moyen Age et a l'Epoque de la Renaissance*, 1878)

often oversaw the education of girls from other families. Depending on the place and the era, many of these ladies kept busy with necessary crafts such as spinning, weaving, and **embroidery.** Some brewed medicinal potions or ale themselves. Each manor or castle was a self-sustaining farm, as much as it could be. A lady had to be at least somewhat familiar with farming, all the crafts, building repair, education, and buying and selling.

When the lord of the manor or castle was away from home, the lady took over all his oversight responsibility. She hired and fired, bought and sold, and even took over the defense of the castle or **house.** She was his representative in all matters. During the **Crusades,** husbands could be away for years, if they came back at all. There was a corresponding rise in the rights and freedoms of these ladies. In some places where women had been barred from directly inheriting land, laws were amended to permit widows or daughters to inherit.

The medieval lady's education varied in place and time. In the early period, while literacy was uncommon and while barbarian invasions kept survival as the primary focus, very few women could read. Only the daughters of some kings such as Charlemagne learned to read. By the 11th century, most upper-class girls were learning to read. They needed to read in order to amuse and educate themselves and to keep their husbands' accounts when they were in charge. Many girls learned some form of **music** and **dance.** They learned a strict code of manners: how to greet, converse, and eat, as well as how to handle difficult social situations. The lady's role in public was to appear beautiful and serene and to give no sign of trouble if she was anxious or unhappy. A lady's stressful face might give away her husband's secret troubles.

The condition of widows varied greatly. In some places and in some eras, a widow had few rights. In 12th-century England, unless a widow bought back the right to raise her children and give them in marriage, they were removed, regardless of age, and placed with a guardian. Guardianships could be sold several times until the child came of age, so many widows tried to buy back these rights. In England, they automatically received one-third of a husband's estate to keep, but no more. In other places, they could retain the whole estate and live with independence, or they could return to their family's home to be cared for or remarried.

The image we have of the medieval lady is a fairy-tale construction blended with truth. Most upper-class women led difficult lives, although they were surrounded by luxury. Their marriages were often unkind, since they were matched on the basis of land, money, or power. But they lived on a plane above the noise and dirt of the classes below them, and they left behind an impression of magical elegance. Some of this image comes from the romances and **troubadour** songs. Many romances told the stories of beautiful, refined, intelligent, sweet ladies who won the love of kings and **knights** and who suffered for this love. While some real ladies led such lives, most did not.

Women in towns had fewer restrictions than castle ladies. They worked hard, starting in childhood, but had more control over their own destinies. Some town girls became apprentices on their own, in some eras and places. More often, girls helped in the family trade and then helped their husbands in their trade. Wives worked next to their husbands in all kinds of crafts, and the craft **guilds** made exceptions for wives, daughters, and some female servants to work in trades that were generally barred to women. Widows often carried on a husband's craft or business.

Cities included a wide range of material wealth. Some women in town were servants, living in a back room of the house and never earning enough to move into anything better. These women tended (and breastfed) **babies,** cleaned, washed, sewed, and did all the laborious work of a

house. Their wages went up and down as conditions changed. Sometimes their parents were paid for their labor so that they helped support younger siblings at home. Some worked to save for a dowry. Being a servant was still considered better than living in poverty in the country, and servants could move up to better employment if they had skill and good recommendations.

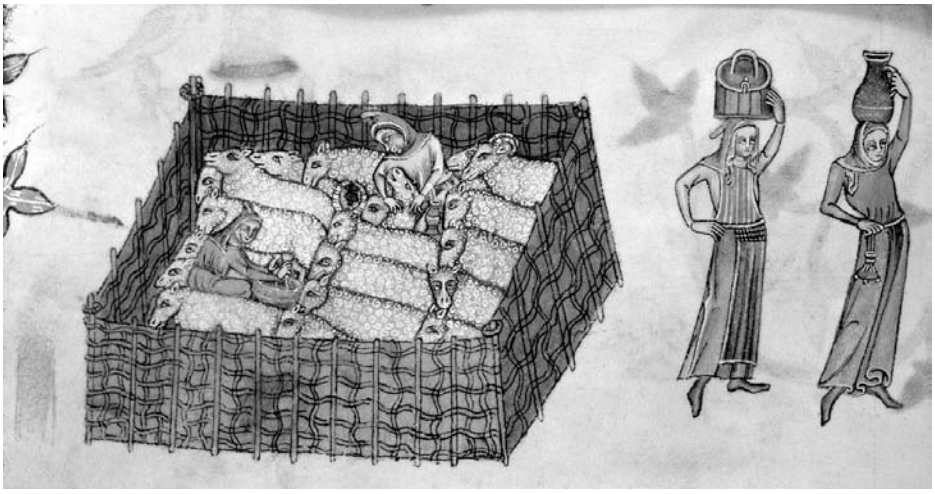
At the top of the urban scale were the merchants' wives, who might live with more luxury than castle ladies. By the end of the Middle Ages, merchants' town houses had every possible comfort. The sumptuary laws tried to prevent their wives from dressing like noblewomen, which shows that they could afford it, and many were doing so. Less wealthy crafts supported women and families on a more modest scale. They were busy and generally lived in financial security.

The trades of spinning and brewing were dominated by women. Many town women made and sold beer or ale out of their homes. Every woman kept a spinning distaff nearby and used wasted minutes to add to a growing spindle of thread. Some women spun for a living. Our term *spinster,* meaning an unmarried woman, comes from this large group of women who kept themselves alive without the support of a husband, industriously spinning yarn and thread at all hours. While weaving was a man's job, lace making and silk weaving were dominated by women.

Medieval farm workers formed the backbone of the economy. They were either free or unfree. Unfree peasants were not exactly **slaves,** but they did not have the freedom to move away or alter their terms of employment. They were born to live on a manor, and they stayed on that manor unless they were granted freedom or unless they paid an annual fee for permission to live in a town. We also call these unfree farmers "serfs." Free farmers were not necessarily better off financially, but they did not owe the same obligations to a landowner and could move if they chose.

The women of these farm families, both free and unfree, had very few options. They worked hard next to the men, helping sow and harvest and care for the **animals.** They cut firewood and hauled water. In addition, they cared for children and made as much as possible of what their family would need through spinning, weaving, and sewing. They cooked and brewed, and they gathered seasonal fruit and nuts. Most peasant families were very poor, and the lives of these women were hard. Some obtained permission to work in a nearby town as servants, but otherwise, they married locally and carried on with peasant farming life as they had always known it. Those who lived near a market were often able to earn extra money by brewing ale, like town women.

During the early 12th century, women began trying to join or imitate men's religious orders. Some of the **monastic** orders welcomed and protected them, and others did not. Throughout the 12th and 13th centuries,



Poor women generally had more freedom of expression and travel than castle women, but they also had ceaseless hard work. These women are helping with the daily task of milking the sheep. They also made the butter and cheese, spun the sheep's wool, and kept up innumerable other chores such as making ale, tending children, gathering wood, and sewing. (The British Library/StockphotoPro)

the attitude of the Popes changed. Some viewed women's vocations with suspicion, while others admitted that women, too, could be called to a religious life and were mainly concerned with their support, protection, and regulation.

Early orders of nuns were informal. Many wealthy young women in Flanders and northern France left their homes and refused marriages, instead choosing lives of complete poverty in the order of Beguines. The Beguines had no property and lived in huts of their own choosing, rather than in a convent. Saint Clare, their founder, was a friend of Saint Francis and considered herself personally to be under his pastoral care, although he resisted any oversight of women.

As more women clamored to join orders, the **church** had to make formal provision for them. The Cistercian order of monks admitted women's convents to its rule, provided that they follow the same rules of order and discipline. Cistercian convents multiplied in France and Spain, probably because the Cathar religious movement, which had been suppressed violently, allowed for religious vocations of women; the church needed to supply this need in order to rule out a Cathar revival.

By the later Middle Ages, many convents owned vast property, served as boarding **schools** to the children of the rich, or took in society women who did not have a serious vocation. Unwelcome daughters could be placed in a convent, without regard to their wishes. Poor and serious convents still existed, but there were many nuns who did not take the religious life seriously

and who gave convents a bad reputation. They kept pets, visited men, and neglected chapel.

A few women lived unusual lives for their times. Some were religious—abbesses who wrote well-known books. Italian legend said that a woman taught at the **medical** school in Salerno in the 11th century. Her name was Trotula, and although a real person cannot be positively identified, medical books under her name circulated during the 12th and 13th centuries.

Two French ladies lived unusual, famous lives in the 15th century. Christine de Pizan was born in 1364. When her husband, a French court secretary, suddenly died, Christine turned to writing love ballads to support her family. In time she became one of the most successful writers in France. In 1405 she published *The Book of the City of Ladies* and later wrote *The Three Virtues,* both of which discussed the proper lives and roles of women. A famous illustration shows her offering her newest **book** to the queen.

Joan of Arc is perhaps the most famous medieval woman, although her life was very short. As a teenager, she saw visions of **saints** who urged her to go to the court at Chinon and present herself as a military commander. The uncrowned French king Charles VII was on the verge of losing his kingdom to combined English and Burgundian forces. Wearing white **armor** and urging confident, offensive action, Joan led the armies of France and Aragon to several victories. After King Charles VII captured Paris and was crowned, Burgundian forces captured Joan. King Charles did not ransom her, and she was sent to the English to be tried as a heretic for hearing voices and wearing men's **clothing.** Joan was burned at the stake in 1431.

See also: Babies, Beverages, Minstrels and Troubadours, Monasteries, Weddings.

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Z

Zoos

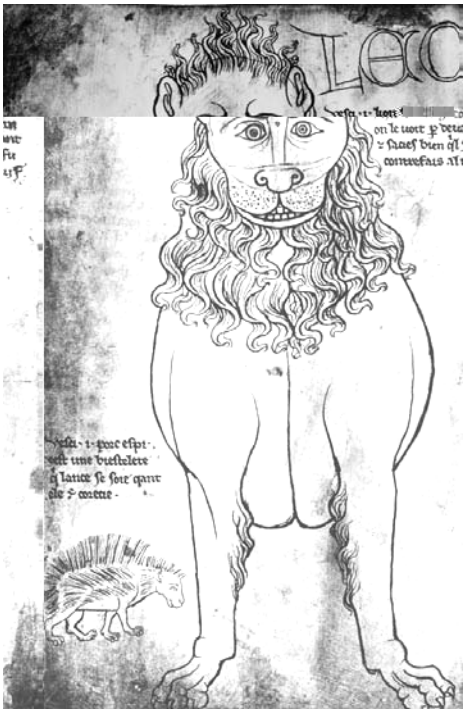
Many kings and noblemen (and even some Popes) kept menageries of exotic **animals,** following the example of Roman emperors. The Roman emperors used some of the animals for public displays at the Circus. Medieval monarchs rarely, if ever, had fighting exhibitions in the Roman style. Some had public parades of their animals to show their magnificence. A favorite theme was to have exotic animals paraded with foreigners from Arabia or Ethiopia in order to suggest that the king was dominant over these far-off regions.

The earliest medieval zoos were in **Muslim** Spain. The caliphs in Cordoba kept a large zoo of exotic animals, many imported from Africa and Asia. It was surrounded by a moat to keep the animals secure. In the ninth century, Charlemagne kept a menagerie at Aachen, in a **climate** colder than most of the animals were adapted for. The caliph of Baghdad sent an elephant for his collection, which had to make a long journey on foot over the Alps and only lived a few years. Charlemagne also kept camels, lions and monkeys, and a few bears.

Beginning with William I, the English kings kept a menagerie that was housed at the Tower of London by the middle of the 13th century. The records are not clear as to which animals lived there at which times, nor how they were fed or cared for. One chronicler stated that Henry I had a victory parade in Normandy that included a leopard riding a **horse** and a panther pulling a chariot. Another reported that King Henry II of England kept a menagerie of exotic animals at his palace at Woodstock. Reportedly, he had lions, leopards, camels, and a porcupine.

Henry III kept a pair of leopards or lions at the Tower of London, a gift of Emperor Frederick II of Germany. His son, Prince Edward, became known as the "Leopard Prince" in association with both the **heraldic** and the menagerie cats. Henry III added a polar bear, a gift from the king of Norway. The keepers allowed the white bear to swim in the Thames on a leash, catching its own **fish,** but kept it muzzled the rest of the time. In 1254, Henry's brother-in-law, King Louis IX of France, sent him an elephant. It lived in a special house in London and was eagerly viewed by the public, but it did not live more than a few years.

The Tower of London continued to have a royal menagerie, probably housed mainly in the gatehouse of the Lion Gate. As animals died, they replaced the lions, leopards, and bears, with at least one more polar bear making its appearance in the reign of Edward I. Tower records show that each lion ate one quarter of a sheep every day, making them very expensive pets. By the 15th century, the collection was not large, but it was still in existence. The Lion Tower began to admit some paying visitors to see the animals. King Henry VI decreed that in lieu of a cash fee, visitors could offer



Modern eyes, used to seeing African lions in films and at public zoos, would not consider Villard de Honnecourt's sketch of a lion very lifelike. Honnecourt was clearly working from a real lion, but his impression of the lion had been shaped by standard paintings that were not accurate. It was rare to have a chance to watch one long enough to observe the shape of its facial features, the way it moved, and its proportions. Private zoos offered the sole opportunity, but only on rare occasions. (Bibliotheque Nationale, Paris/Giraudon/The Bridgeman Art Library)

an animal, such as a dog, cat, or sheep, to feed the lions. In 1436, the lions died, presumably of an illness, and the collection had to be started again.

The largest royal menagerie on the European continent may have been the one owned by Frederick II of Germany in the 13th century. He kept it at his palace in Palermo, Sicily. Frederick was a highly educated, intelligent man with a keen interest in science. He kept lions, leopards, camels, elephants, and a giraffe and sometimes displayed them in parades. The kings of France also had menageries at some of their castles: elephants, bears, lions, and porcupines are among those recorded, as well as exotic birds. King Charles V kept a porpoise in a pool, and even the duc de Berry kept bears. The 14th-century Popes who lived in splendor at Avignon kept exotic animals, including peacocks, ostriches, and camels, as well as the common lions and bears.

Italian **city** menageries kept many lions. Medieval Rome, like ancient Rome, kept lions as a symbol of its dominance. Florence kept a pit of 24 lions and sometimes used them in fighting displays against other animals. Venice's lions were observed as the lioness gave birth to three cubs, and to everyone's amazement, the cubs were born alive. Bestiaries had explained confidently that lion cubs are born dead, and are licked back to life after three days, as a picture of Jesus's death and resurrection. Once

Europeans had even a limited opportunity to observe lions and other animals firsthand, they stopped trusting the ancient myths passed down by the bestiaries.

See also: Animals.

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